ELECTRICAL REVIEW

Vol. CLI 24th OCTOBER, 1952 No. 3909

Managing Editor: HUGH S. POCOCK, M.I.E.E. *Technical Editor:* W. O. FENWICK, M.I.E.E.
Industrial Editor: J. H. COSENS *Technical Consultant:* C. O. BRETTELLE, M.I.E.E.

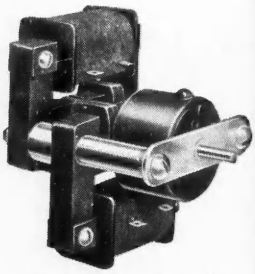
IN THIS ISSUE

Electricity and National Prosperity	875
Harlow New Town	877
The Reheat Cycle. By J. R. Finniecome, M.Eng., M.Inst.C.E., M.I.Mech.E., A.M.I.E.E., F.Inst.F.	883
Power Station Instrumentation	885
Vocational Training	886
Fuel Cells. By A. P. Paton, B.Sc., A.M.I.Mech.E., A.M.I.E.E.	888
Engineering in Europe	891
Views on the News	893
Personal and Social	894
Correspondence	898
Overseas Electrical Trade	899
Radio Engineers	901
French Hydro-Electric Power	902
Recent Introductions	905
Electricity in the Areas	907
A.S.E.E. Presidential Address	909
Commerce and Industry	911
Aluminium Sheathed Cable	915
Electricity Supply	917
Financial Section	920
Next Week's Events	924
New Patents	925
Contract Information	927
Classified Advertisements	135
Index to Advertisers	150

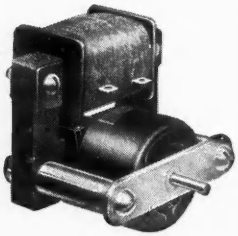
EDITORIAL, ADVERTISING & PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home and Overseas £3 6s 0d: U.S.A. and Canada $11.00. Cheques & P.O.s (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."

ELECTRIC SYNCLOCK *Miniature Motors*

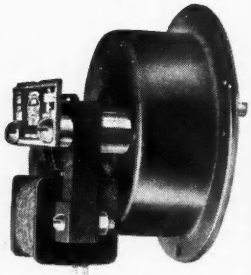
FOR OPERATING ALL FORMS OF TIME MECHANISMS



Type MBX Motor (reversible)



Type MB Motor



Type C Motor

The Synclock Motor was the first miniature synchronous motor to be produced in this country. After twenty years' experience of its production and operation we feel proud that it continues to hold its place as the basis of many timing mechanisms, chart drives and other equipment where a really reliable miniature motor is required.

The Synclock Motor offers outstanding features not combined in any other single design :—

* Inherently self-starting.
* Reaches synchronous speed in less than three cycles.
* High starting and running torques.
* Self-contained gear box with oil bath.
* Main output bearing, oil-impregnated bronze.
* Rotor and Gears can be withdrawn for servicing.

TECHNICAL SUMMARY

Output speed of standard types : 1 r.p.m. or 1 r.p.s.
Output speed of Special Type B : 3,000 r.p.m.
Other speeds available with external gearing.
Standard Motors available for 12½, 25, 33⅓, 40, 50, 60 and 100 cycles per second.

Continuous running torque in gm. cms.

Type	M.B.	C.	C.K.
At 1 r.p.m.	400	1,000	1,500
At 1 r.p.s.	10	25	40

CATALOGUE SHEET: No 600 A

Makers of electrical instruments for indicating, recording and controlling ; photometric apparatus ; process controls.

EVERETT EDGCUMBE

COLINDALE WORKS, LONDON, N.W.9
TELEPHONE COLINDALE 6045

ELECTRICAL REVIEW 24th OCTOBER, 1952

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLI • NO. 3909

Electricity and National Prosperity

IN the last fifty years electricity has been an ever-expanding factor in our national life until to-day it has become the prop on which the whole economy rests. In fact it is now so taken for granted that it is rarely appreciated to the full even by people engaged in the electrical industry itself. It is therefore salutary that from time to time leaders of the profession and industry should survey what has been achieved and indicate what future trends are likely to be. Only thus can the industry hope to bring the Government and others concerned to a realization of the need for removing obstacles to the expansion of electricity supply and active encouragement of electrical development.

The new President of the Institution of Electrical Engineers, Col. B. H. Leeson, possesses the qualifications and experience needed for this purpose and his address was an excellent and succinct study of the part which electricity plays in the national struggle to pay our way. We dealt last week with the first part of the address which was concerned with the Institution itself and with education and training. An interesting analysis was made of the I.E.E. membership, showing that about a third of the members were connected with the manufacturing industry.

This industry now employs nearly 600,000 workers and those in the electricity supply and contracting industries bring the total to 846,000. Electrical equipment production had a value of about £700 million last year and about 27 per cent of this was directly exported, apart from the unknown quantity which formed part of exported machinery, etc., of various kinds. The electrical manufacturing industry itself is an efficient one and its products raise the efficiency of other branches—where those branches take advantage of their opportunities. It is still true that the British worker has far less power at his elbow than the Americans. Col. Leeson referred to this " striking disparity " as a clear pointer to the road which industry must take, but he also stressed the fact that, before

all, there was a need for more man-hours of work. These extra man-hours must be fully productive—not merely the same effort spread over a longer time. From this we can expect greater production of basic commodities (including more coal for export) and improved fuel and power supplies for industry and the home. More capital is also required, meaning greater savings by Government, industry and individuals. The way to recovery is thus made plain: all that is needed is individual and collective discipline and drive.

INSTITUTE OF TECHNOLOGY

The transfer of responsibility for maintaining the engineering and science departments of Loughborough College to the Ministry of Education seems reasonable. Only about 4 per cent of the students come from the area of the Leicestershire local education authority, the reputation of the College being such as to attract entrants from all over the country. Of more general importance is that the Institute of Technology (as it will be known) is to be industry-based on the lines of the recommendations in Col. B. H. Leeson's I.E.E. presidential address, as several members of the governing body are connected with works production and others are representatives of leading technical institutions and other appropriate authorities.

HOME AND OVERSEAS

The point of broadest significance in Mr. C. T. Melling's presidential address to the A.S.E.E. on Tuesday (reported in this issue) was perhaps his reference to capital developments in this country. Any assessment of relative merits should take into account their value as a means of furnishing a proving ground and a recommendation of quality in service to world markets. The value of the grid in giving opportunities for full-scale testing of high-voltage apparatus under operating conditions is supplemented by the value of consumers' freedom of choice (which itself provides a rigorous test of quality) in regard to domestic electrical appliances for which the demand in other countries is growing.

WATER-MAIN EARTHING

Steel pipes continuously protected by bitumen reinforced by glass wrapping would not provide the widespread and intimate contact with the soil which has been the basis of the long established practice of earthing to water mains. Neither would polythene or polyvinyl chloride or asbestos cement pipes. All these are noted in the report of the Working Party on Small Diameter Water Pipes as possible substitutes for the comparatively cheap galvanized steel pipes, which are no longer permitted in some rural areas because of their liability to severe corrosion. The report thus reinforces recent warnings regarding the need for fuller adoption of other means of earthing for safety.

FREEDOM OF CHOICE

Some local authorities contend that the Electricity Boards are holding a pistol at their heads by requiring contributions towards the heavy cost of providing services to council houses when the councils decline to provide adequate electrical installations. It is quite obvious that unless other consumers are to subsidize council house tenants the latter must contribute their fair share of the cost whether by direct payment or through their electricity bills. The South Western Electricity Board in its annual report advocates consumers' freedom of choice of services and puts the position quite neatly when it says:—

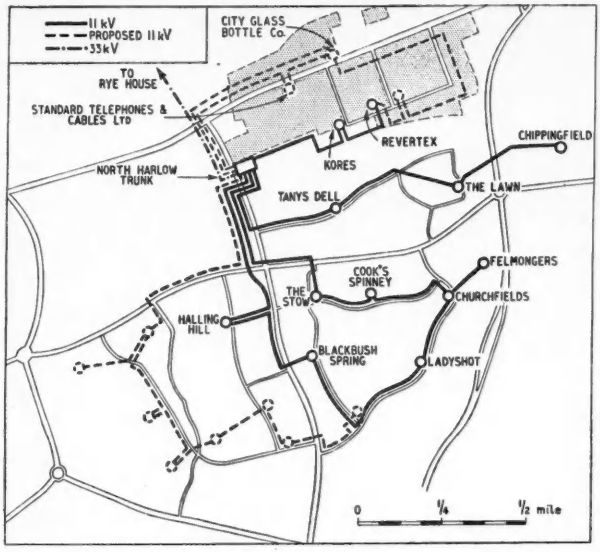
> "By arranging for adequate wiring installations, an increasing number of local authorities are giving their tenants this choice and are at the same time gaining the financial advantage of the better terms of supply which the Board are able to offer for the better employment of the capital invested in the systems."

Harlow New Town

Provision of Electrical Facilities

SUFFICIENT progress has now been made with the first section of Harlow New Town to give an idea of both the final scheme and also the electricity supply arrangements. About twenty-three miles north-west of London, the New Town, like others now being constructed, is part of the plan to decentralize some of London's population and industry. Harlow covers 6,320 acres and extends in its widest parts about 3½ miles from north to south and about 4½ miles from east to west. It is being designed as an entirely self-contained community and it will provide a wide variety of homes and occupations as well as cultural, educational, health, shopping and entertainment facilities to meet the needs of its 80,000 inhabitants. Only about a third of the land will be covered by houses, schools, factories and roads: of the remainder some will be farmed and some will be open park land.

The whole scheme for which the Harlow Development Corporation is responsible to Parliament is expected to take at least twenty years to complete. Present activities are confined to the north-east quarter of the area, the part nearest the old town of Harlow. In addition to a 160 acre industrial estate, this comprises a residential area termed the Mark Hall-Netteswell "neighbourhood unit," which will eventually accommodate about 5,200 houses. There will be three such neighbourhood units each with its own shopping centre, primary school and meeting hall



The Mark Hall-Netteswell neighbourhood unit and the Eastern industrial estate showing portion of trunk and local substations

situated near its centre. In addition there will be a town centre to serve the whole of the New Town embodying the main shopping centre, civic and administrative buildings, etc.

All types of dwellings are being provided from single flats for bachelors to five-bedroomed houses for large families. As well as these various types there are different standards of equipment and finish for different income groups. The housing layouts are being carried out on the principle of mixed development, both flats and houses being grouped together to give visual variety. In one instance long two-storey terraces are grouped round a space in which is situated a large four-storey block. In another a nine-storey tower of one- and two-room flats forms the focus about which are grouped terraced houses, a three-storey block of flats and semi-detached houses.

Before, however, a beginning was made on the main scheme for the New Town a small site of 11 acres on the Chippingfield Estate just south of the Old Town and on the east of the main London road was developed to provide houses for "key personnel." The first of these premises, which are of the two- and three-bedroomed type, were completed in 1950 and the estate now comprises 118 houses.

The eastern industrial estate, as it is called to distinguish it from the western estate to be developed later, is close to both the railway and the main London road. Three different types of factory are being provided: special-purpose premises to be built by industrialists on sites leased for 99 years, standard factories of about 20,000 sq ft floor area erected by the Development Corporation and sectional factories in 2,000 sq ft units, also built by the Corporation.

Five of the larger factories have so far been completed, three standard and two special. The first occupied was that of the British Hydromechanics Research Association, which is expected to have an electrical load of from 30 to 50 kW. The other four are now being operated by Sunvic Controls, Ltd. (50 kW), Revertex, Ltd., synthetic resin and rubber manufacturers (150 kW), Services Electronic Laboratories (150 kW), and Dorstel Press, bookbinders (70 kW). Premises are also under construction for Standard Telephones & Cables, Ltd. (anticipated load 100/200 kW), the Edison Swan Electric Co., Ltd. (70 kW) and the Kores Manufacturing Co., Ltd., makers of carbons, ribbons, stencils, etc. (70 kW). Another of the larger factories is being temporarily equipped as a cinema.

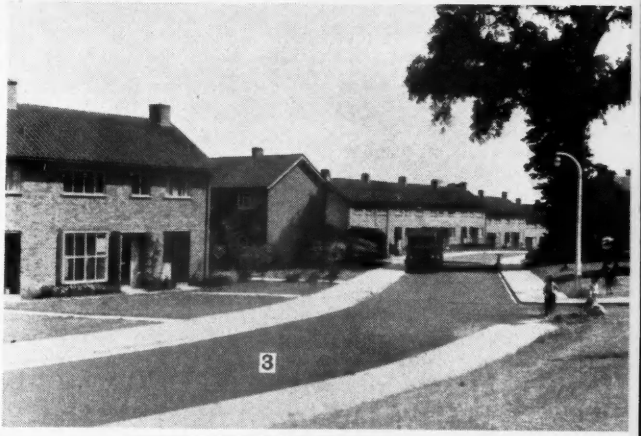
The factories of the sectional type already in use include those of Dairy Pipe Lines, Ltd.; O. C. Products, Ltd., precision workers; Airmed, Ltd., surgical mouthpiece manufacturers; Vernon Tools, Ltd.; Greenpar Motor & Mechanical Engineers, Ltd.; Sheardown Engineering Works; and V.M.E. Engineering, Ltd. Under construction are premises for Charles & Read Engineering,

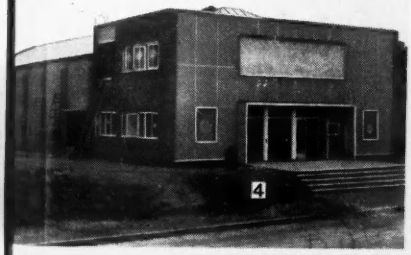
PROGRESS OF DEVELOPMENT

(1) Stow shopping centre

(2) Sectional factories of 2,000 sq ft floor area are available

(3) A road on the Chippingfield Estate showing street lighting standard

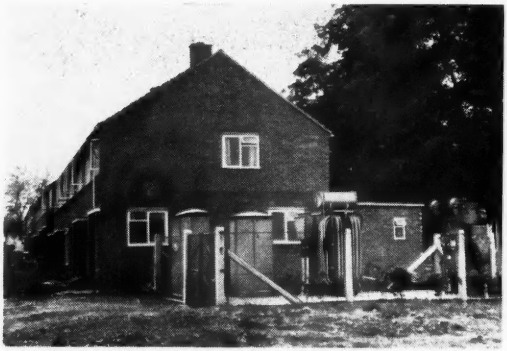




(4) One of the larger standard factories is being temporarily equipped as a cinema

(5) Group of houses and flats on the Mark Hall North Estate

(6) Row of larger standard type factories: the nearest is occupied by Sunvic Controls, Ltd.



Outdoor substation at The Lawn, showing 500 kVA transformer, ring main unit, distribution kiosk and street lighting control unit. A beech and holly hedge has been planted and will eventually screen this substation

by looping in an existing 11 kV overhead line. Soon, however, a 33 kV supply will be provided from the new Rye House power station and the 0·2 sq in overhead lines for this are now well advanced. The first of three new 33 kV substations which are to be erected is now nearing completion on a site at the south-western edge of the eastern factory estate and is expected to be in operation later this year. It is designed for a total capacity of 30 MVA and is being equipped with two 15 MVA 33/11 kV Fuller transformers and B.T.H. double busbar 11 kV switchgear.

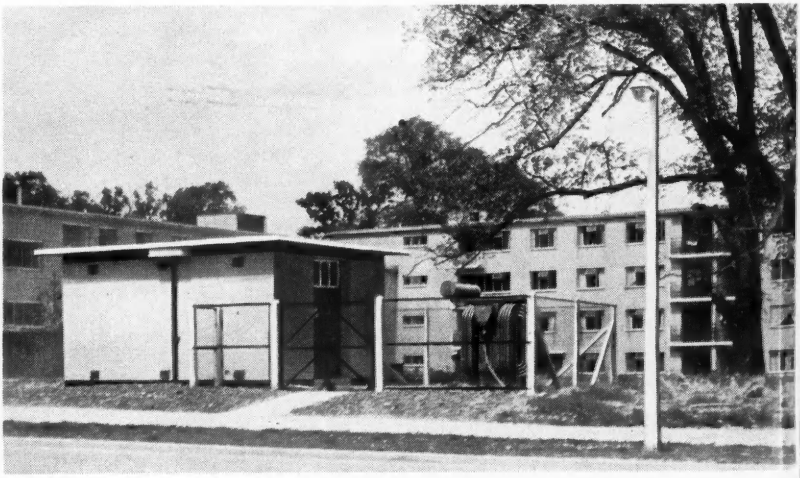
The 11 kV supply to the factory estate will eventually be by means of a ring main, with interconnector. The other two 33 kV substations to be constructed to meet requirements as the town expands, will be situated near the western industrial estate and to the south of the area.

Two types of local 11,000/415/240 V substations are employed: a brick-built unit designed initially with a capacity of 750 kVA and ultimately for 1,500 kVA,

Ltd.; Dawson Engineering, Ltd.; Smith's Engineering; and Havelock Engineering, Ltd. All these factories will have loads ranging from 10 to 30 kW. The City Glass Bottle Co., Ltd., is also proposing to erect a large factory with an ultimate load estimated at 315 kW.

At present the Eastern Electricity Board, Northmet Sub-Area, Bishop's Stortford District (District manager: Mr. W. H. Hatton-Ward) is supplying the New Town

Typical brick-built substation at Tanys Dell. Shrubs will be planted to form a screen



and an outdoor type with a capacity of 500/750 kVA. The brick-built substations are equipped with 11 kV oil circuit breakers, "Solkor" protection being provided on the feeder switches, and direct acting trip coils shunted by time limit fuses on the transformer switches. The outdoor transformers are sited at the rear of the building, one 750 kVA unit being installed initially with space for a second. In certain cases feeders will be taken out from these multi-circuit-breaker substations direct on to remote single outdoor transformers, which will feed into l.v. feeder pillars, suitably situated in the l.v. network.

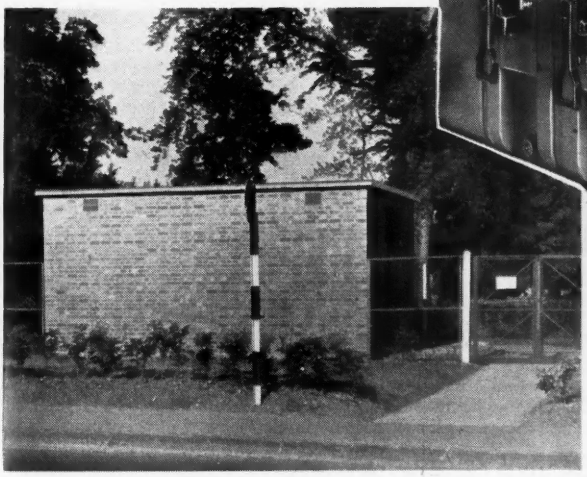
Between the multi-circuit-breaker substations will be connected not more than two outdoor type substations. These consist of an 11 kV ring main unit having isolators in the feeder circuits and oil immersed h.r.c. fuses controlling the transformer, a 500 or 750 kVA 11 kV/l.v. transformer, a feeder pillar to house the fusegear controlling the l.v. distributors, and a smaller pillar housing d.c. bias street lighting control gear.

Tanys Dell substation, which is typical of the brick-built multi-circuit-breaker type, is equipped with an 11 kV 150 MVA B.T.H. "QA" type switchboard controlling two feeders and one transformer, a 750 kVA J. & P. outdoor type transformer and a Lucy l.v. distribution panel.

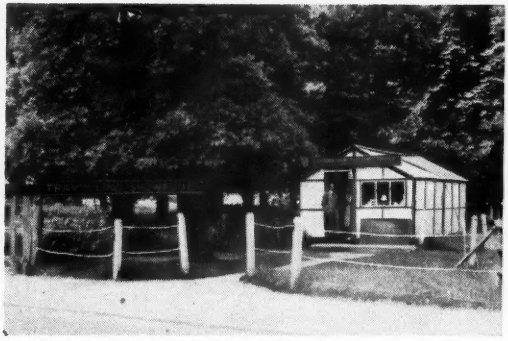
Two brick-built substations, one at Chippingfield and the other at Tanys Dell, and four outdoor substations at Revertex, The Lawn, Cook's Spinney and The Stow, have so far been commissioned.

A Standard Telephones d.c. bias system is employed for automatically controlling the street lighting, the initial section of which provides for 131 pre-stressed concrete standards (thirty-two 60 W sodium and the remainder 100 W tungsten) and fluorescent lamps or floodlights in the shopping centres. Provision is made for either all-night or half-night illumination.

So far the Eastern Electricity Board has laid 6,000 yd of 11 kV cable and 16,000 yd of l.v. mains to supply about 1,100 domestic and 30 industrial consumers and over 200 additional services have been laid in



Chippingfield substation, the first brick-built substation erected in the New Town and *(above)* **B.T.H. 150 MVA "QA" switchgear installed in the substation**



A travelling showroom has been provided for the benefit of new consumers

readiness for new consumers. Consumers are now being connected at a rate of about 1,000 a year and when the Potter Street area (the south-eastern portion of the scheme) is developed the rate of connection will be raised to 2,000 a year. All domestic premises are wired for lighting, power, cookers and immersion heaters. The nine-storey block of flats referred to is all-electric, having no facilities for the use of solid fuel or gas, and there are further blocks with no gas. Special assistance is given to newcomers to the area in the solution of their electrical problems and contact is made with incoming consumers with a view to getting everything settled before they move in. A travelling showroom with a staff of three acts as a sub-service centre for Bishop's Stortford and is available as an inquiry bureau.

Our thanks are due to Mr. C. C. Hill, manager, Northmet Sub-Area, Eastern Electricity Board, and Mr. W. Eric Adams, C.B.E., general manager, Harlow Development Corporation, for permission to publish this article.

INDIAN ACTIVITIES

WE are indebted to *Indian Trade and Commerce*, an official publication issued from the office of the High Commissioner for India in London, for the following information.

A recent trade agreement between the Government of India and the Austrian Federal Government provides for the interchange of a number of classes of goods. Exports from India to Austria will include shellac, iron ore and manganese ore. Austrian exports to India will include power station equipment, cables and conductors, electro-medical apparatus, installation material, fluorescent lamps, etc. Licences for specified amounts will be issued, apart from Austria's participation in India's general trade. The import and export schedules under the agreement run for a year from 1st July last but can be extended by mutual agreement.

The Indian Standards Institution has recently published an Indian Standard Specification for the marking and arrangement of switchgear busbars, main connections and auxiliary wiring. It prescribes definite colours for this equipment for different supply systems, including d.c. We are told by the British Standards Institution that the Indian specification follows very closely B.S. 158.

Approval has been given by the board of the Council of Scientific and Industrial Research to a plan and estimates for a Mining Research Station attached to the Fuel Research Institute at Digwadih, near Dhanbad. The station is estimated to cost £84,000 initially and £15,000 annually. It will undertake investigations on mine ventilation, mine lighting, spontaneous combustion in mines, and electrical and mechanical mining equipment.

It has been decided by the Government of India that the validity of all current licences for the importation of motors and generators under Section 32 of Part II of the Import Trade Control Schedule shall be extended (on application) from twelve to eighteen months. The concession does not extend to generators covered by open general licence or three-phase squirrel cage motors up to 30 h.p. for 200/220, 400/440 or 500/550 V, horizontal or vertical spindle, screen protected or drip-proof, fan cooled or totally enclosed (including loom motors).

The Reheat Cycle

Some Comments on the Combined Leaving and Exhaust Loss of Non-Reheating Turbine Plant

By J. R. FINNIECOME

M.Eng., M.Inst.C.E., M.I.Mech.E., A.M.I.E.E., F.Inst.F.

MR. J. C. LONDON was well justified in re-emphasizing in the correspondence columns of your issue of 12th September that in his analysis of the thermal improvements obtainable at higher steam pressures and temperatures in regenerative reheating plant he had assumed a constant combined leaving and exhaust loss of 11·2 B.Th.U./lb. He also pointed out in his paper that this value was originally used by Baumann and myself in earlier contributions on the improvements in the thermal efficiencies of non-reheating plant. Mr. London very wisely took the same value, for it enables one to obtain a simple and direct comparison of the improvements in the performance due to reheating.

It must be fully appreciated that the combined loss depends primarily on the total volume of steam flowing through the last row, or rows, of blades and the exhaust, or exhausts, their sizes depending on the dimensions selected by the designer for a particular capacity or rating.

I consider it appropriate to direct attention to the variation of the combined loss of a non-reheating turbine operating at pressures varying from 600 to 2,000 lb/sq in at corresponding economic feed temperatures and constant stop valve temperatures of 800 and 950 deg F and 29in vacuum (30in Hg barometer) assuming a constant leaving and exhaust area for all conditions. The results of my investigations, which involved laborious calculations, are summarized concisely in Tables I, II and III. Their values are based on the 1939 Callendar's Steam Tables and his Total Heat Entropy Chart, and on the recently determined economic feed temperatures and Baumann's operation factor m = 200, where m is the ratio of:

$$\frac{\dfrac{\text{Cost of fuel in shillings per ton}}{\dfrac{\text{Calorific value of fuel in B.Th.U./lb}}{10{,}000}}}{\text{Rate of capital charges (per cent)}} \times \text{Load factor referred to installed capacity (per cent)}$$

The following conditions were assumed at the time the calculations were made.

Cost of fuel ..... 40 shillings/ton
Calorific value of fuel.. 10,000 B.Th.U./lb
Load factor ..... 50 per cent
Rate of capital charges ..... 10 per cent

Table I.—Ratio of the percentage combined leaving and exhaust loss at the economic feed temperature for non-reheating plants

Stop valve pressure lb/sq in g	Stop valve temperature			
	800 deg F		950 deg F	
	Five stages	Seven stages	Five stages	Seven stages
600	1·000	1·000	1·000	1·000
800	0·905	0·903	0·910	0·908
1,000	0·835	0·832	0·850	0·847
1,200	0·785	0·781	0·805	0·801
1,400	0·740	0·735	0·770	0·765
1,600	0·705	0·700	0·745	0·740
1,800	0·675	0·665	0·720	0·710
2,000	0·645	0·635	0·700	0·690

Table II.—Percentage combined leaving and exhaust loss at the economic feed temperature for non-reheating plants

Stop valve pressure lb/sq in g	Stop valve temperature			
	800 deg F		950 deg F	
	Five stages	Seven stages	Five stages	Seven stages
600	1·800	1·800	1·320	1·320
800	1·64	1·637	1·205	1·203
1,000	1·52	1·515	1·120	1·116
1,200	1·42	1·415	1·060	1·055
1,400	1·35	1·340	1·016	1·010
1,600	1·28	1·265	0·980	0·970
1,800	1·23	1·210	0·950	0·940
2,000	1·18	1 160	0·920	0·910

Table I presents the ratio of the percentage combined losses at the economic feed temperature for non-reheating turbine plant at various stop valve pressures to that at 600 lb/sq in gauge for temperatures of 800 and 950 deg F and for five and seven stage feed heating. It will be observed from Table I that at 1,400 lb/sq in gauge and 950 deg F the combined loss for the same leaving and exhaust area and for five stage feed heating is 0·77 times that at 600 lb/sq in gauge and 950 deg F.

Assuming that the percentage combined loss is 1·32 per cent at 600 lb/sq in gauge and 950 deg F (see Table II) then at 1,400 lb/sq in gauge and the same temperature it is only 1·016 per cent and represents an improvement of the thermal performance of 0·23 per cent. Similarly Table II gives the percentage combined loss based on 1·8 per cent at 600 lb/sq in gauge and 800 deg F for 11·2 B.Th.U./lb. Finally Table III indicates the combined loss in B.Th.U./lb at various stop valve pressures and temperatures of 800 and 950 deg F for five stage feed heating for a loss of 11·2 B.Th.U./lb at 600 lb/sq in and 800 deg F. The difference in these values for seven and five stage feed heating is minute as shown in Tables I and II. I am sure turbine designers particularly would also welcome such comparative data for reheating plants.

Table III.—Combined leaving and exhaust loss in B.Th.U./lb at the economic feed temperature for non-reheating plant for five stage feed heating

Stop valve pressure lb/sq in g	Stop valve temperature	
	800 deg F	950 deg F
600	11·20	8·90
800	10·50	8·40
1,000	9·95	8·10
1,200	9·50	7·80
1,400	9·10	7·55
1,600	8·70	7·30
1,800	8·40	7·20
2,000	8·20	7·10

The difference between five and seven stage feed heating is very small indeed (see Tables I and II).

I.E.E. London Students

IN his inaugural address as chairman of the London Students' Section of the Institution of Electrical Engineers on 13th October, Mr. B. L. A. Ellings dealt with the protection of running busbars. He explained that such protective schemes operate from currents and voltages derived from current and voltage transformers. The circuit breaker tripping current is taken from a station battery and successful protection clearance depends on the condition of the battery, the continuity of the small wiring including auxiliary switches and trip coils, the proper mechanical maintenance of the circuit breaker operating mechanism, as well as the correct operation of the protective gear in closing its relay tripping contacts.

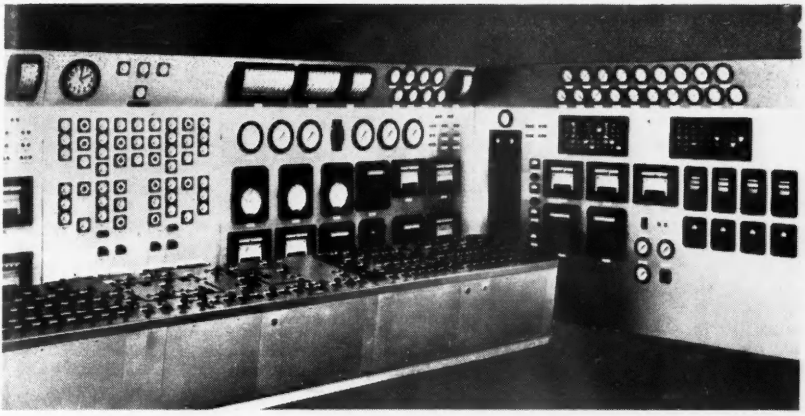
The use of protective gear to monitor the running of most large electrical units has proved desirable and economical during the last 30 years. The expansion of its scope to include the monitoring of circuit breakers and main busbars, however, is still a matter upon which opinion differs.

The frequency at which faults occur on main busbars in this country is about 1 in 20 years, and figures from American undertakings show a frequency of 1 in 15 to 25 years. If the protection can be guaranteed to clear this fault correctly and not to operate at any other time, it is obviously justified. The protection is necessarily complex and since the results of an inadvertent trip are so costly it is usual to provide two lines of defence; the number of mal-operations of busbar protection in Britain is extremely small. All the usual schemes of protection can be modified to cover busbars and Mr. Ellings' address formed an excellent introduction of some of these to the non-specialist.

Removal of Overhead Lines

OVERHEAD wires and pole lines have been removed from part of King Edward Avenue, Vancouver, by the B.C. Electric Co. as the latest step in a $4,500,000 electrical improvement programme. The next step will be installation of distribution lines under the boulevard in fibre conduits laid during recent months. More than 50 miles of three-wire overhead conductor circuit have been removed from the city streets since the war ended and at the same time more than 75 circuit miles of cable have been placed underground. The company's policy is to install circuits underground wherever feasible, but the cost of placing all lines underground is considered to be prohibitive.

Power Station Instrumentation



[*Photo by Panellit, Inc.*

An American Example

CENTRALIZED instrumentation in modern steam generating plants in the United States differs somewhat from layouts in British power stations. This article describes the features of the instrument control room at the new Edge Moor plant of the Delaware Power and Light Co., where two 66 MW steam turbo-alternators have recently been put into operation as a major part of a five-year extension programme.

The control room makes supervision by a single operating engineer possible by means of instrument panels for station service; hydrogen scavenger system; electrical plant; d.c. distribution systems; and boiler-turbine house. Practically all high pressure and liquid level instruments in the central control room are pneumatic receivers actuated by indicating transmitters situated at the points of measurement. Thus only low-pressure air small-bore pipes have to be taken to the instrument panels in the control room.

The illustration shows the central control room, with panel board and control console in duplicate, each governing the operation of one of two boiler-turbine-generator units. The receivers for pneumatic transmitters and multiple-record strip chart recorders are situated on the backboards.

All instruments are in full view of the operator as he stands at the control console. Boiler, turbine and generator operating temperatures are indicated and recorded for the most part on multiple-record strip charts, thus minimizing the total number of recording instruments and saving valuable panel board space. For example, the following temperatures are automatically switched for registering: Generator field; turbine oil; hydrogen and stator cooling water; feed water; flue gas; air inflow; and feed heater water and steam temperatures.

As an example of what lubricating oil temperature values are made available, the following can be obtained from a single record chart: to coolers; from coolers; from forward thrust; from after thrust; from bearings No. 1 to No. 7.

The panel section for station service and for electrical values has a multiple-record strip chart recorder for temperatures of: condensate to coolers; river water from cooler " A "; condensate from coolers; and river water from cooler " B." In the turbine

Above: **Instrument panels in the Edge Moor station of the Delaware Power & Light Co.**

room two pneumatic pressure transmitters are mounted on the starting panel board in full view of the turbine operator and the measured values are pneumatically transmitted to a two-pen recorder in the central control room. One transmitter indicates and transmits the turbine throttle pressure, the other transmits the first stage turbine steam pressure. An idea of the size of auxiliaries in the Edge Moor plant is given by the storage tanks for condensate or boiler drain, one of which is a 50,000 and the other a 100,000 gallon vessel, situated outside. Each tank is equipped with an indicating pneumatic liquid level transmitter which transmits tank level to a receiving instrument in the central control room about 400ft distant. Pneumatic indicating transmitters are used for pressures at economizer, boiler drum and superheater outlet. Millivoltmeter instruments indicate the temperature of the superheater for supervisory use during starting-up.

Chart records in this station are used not only for accounting purposes, but also as a basis for heat balance and efficiency calculations; long-term examination serves also for maintenance checks of the operating trend.

Vocational Training

Underlying Principles and Methods of Conduct

IN his address as chairman of the South Midland Centre of the Institution of Electrical Engineers at Birmingham, Dr. K. R. Sturley (Engineering Training Dept., B.B.C.) discussed the principles underlying vocational technical training and methods by which it was carried out.

The reasons why technical training had become so necessary were considered to be the greater complication of apparatus, the rapid change of techniques as the results of research were applied, the need to reduce the time between starting a new job and becoming fully operative, and avoidance of the waste of trial and error methods.

The chief aims of training must be to develop the skill and capabilities of the staff so that they would maintain satisfaction in their work, be encouraged to adopt a constructive attitude to new ideas and also to increase the efficiency of the individual and of the organization as a corporate body.

Training policy would be influenced by the size of the organization and the type of work. In small organizations responsibility for instruction would rest on a section leader or works manager; much could be accomplished by co-operation between firms and by close liaison with a local technical college.

In a medium sized unit (about 1,000 people) recruitment, training and personnel management could be combined in one department. For larger numbers (3,000 and over) training and personnel management would probably have to be separated and there were dangers of lack of liaison over recruitment. The chief advantage of size was that adequate training facilities could be provided.

Three types of staff must be considered: the graduate, the technician and the craftsman. Apart from a short course on the structure of the industry in which he had just started, the graduate should not be kept long in training as he would be anxious to earn his keep. Technical industrial training, except on the job, should be deferred until he had had about a year in which to become familiar with industrial life.

The technician would require skill in specialized techniques and in the handling of basic tools, but above all he must be able to grasp quickly a problem once outlined. Routine operations might be a part of his duties and then he must have a quick reaction to fault conditions. Specialized industrial training would be essential. The craftsman would require workshop courses which included practice with tools and particular machinery.

The courses would generally be of three types. Basic courses would be needed for new recruits and those intended for promotion. Good morale should be fostered by devoting time to the work and organization of the particular industry and to the prospects of promotion and methods of

achieving it. Conversion courses would be needed to assist those changing their work, or to instruct them in new techniques made necessary by research developments, or changes in public taste. Older members of the staff would require refresher courses.

Training could never be successful if carried on by a number of scattered units; centralization was essential to achieve economy, avoid dissipation of effort, prevent frustration of the instructor and build up a corporate spirit. The advantages of part-time courses were that the student felt he was earning his keep, the instruction and its application to industrial problems ran side by side and the possibility of becoming academic was restrained. Full-time training enabled skill and specialized knowledge to be more quickly acquired without diversion of interest.

The training department should be autonomous with a head of status equal to that of the heads of the departments which he served. He must be given a free hand in the selection of his staff and should have under his control the staff and facilities (such as a hostel for residential students) needed for the efficient running of his department.

Emphasis and Timing

Two dangers must be guarded against: wrong emphasis and wrong timing for both could contribute to staff dissatisfaction after training. Wrong emphasis might lead to overburdening the student with new ideas which he was not expected to put into practice, or might cause him to think he was fitted for more advanced work than was available. One of the training department's most important tasks was to see that the student developed a reasonable and balanced attitude to his job. A long delay between a conversion course and the application of the new skill or knowledge meant wrong timing and would have bad consequences.

Detailed organization of courses was next discussed before Dr. Sturley turned to the training of staff. The instructor-student ratio would depend on the type of training to be given. At lectures a ratio of one to twenty or more was possible; exercise classes, discussion groups and laboratory work needed one instructor to about ten students; for courses in workshop practice or specialized techniques the ratio might have to fall to one to six.

The qualities most desired of an instructor were enumerated; academic qualifications were a valuable but not an essential asset. At least one week a year should be set aside as a refresher period for instructors. If the work were mainly routine and prospects of promotion in the training department were restricted, appointments limited to three or five years were advisable. For higher grade technical training, permanent appointments would have advantages, but staff should then spend about a fortnight every year back in industry.

The head of the department must keep in touch with his staff and students; he would need to be an occasional observer at lectures and should himself take lectures as well as pay regular visits to laboratories. Close liaison with student users would be necessary to ensure that the training fitted staff for their work.

Laboratories and their equipment must be adequate and have maintenance staff and, since apparatus would have to be built to illustrate teaching points, a well equipped workshop, which should not be used for training, was necessary.

It must be a matter of concern that so little organized industrial training existed for employees in small firms. Could not some form of co-operative training be linked with the research associations? That would have the probable advantage of obtaining a quicker acceptance of research developments. A census of available facilities needed to be taken and it was probable that it would show that much more use could be made of existing organizations.

The I.E.E., which had always shown keen interest in formal training, might well turn its attention to industrial training.

Vitreous Enamelling

AN illustrated brochure of 40 pages on "The Theory and Practice of Vitreous Enamelling" has been compiled by Mr. J. H. Gray, a director of Stewart & Gray, Ltd., enamelling engineers, of London, whose object has been to present a practical description in clear terms of all aspects of the vitreous enamelling of steel and cast iron, yet with sufficient detail of the theory of the process to serve as an introduction to more advanced standard treatises on the subject. Copies, price 10s 6d, are obtainable from the secretaries of the Institute of Vitreous Enamellers, c/o John Gardom & Co., Ripley, near Derby. All proceeds from the sale of this publication are to be given to the funds of the Institute.

Fuel Cells

Account of Research and Present State of Development

By A. P. PATON, B.Sc., A.M.I.Mech.E., A.M.I.E.E.

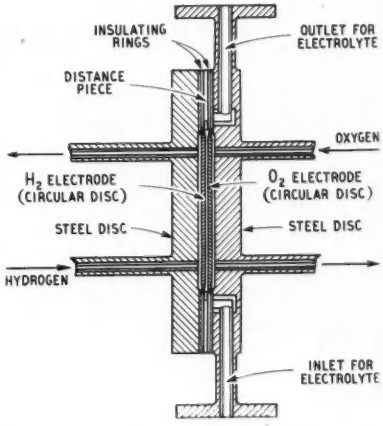
ANY cell in which the energy released by a chemical reaction is converted directly into electrical energy is properly described as a primary cell. An ordinary dry battery is a simple example, the electrical energy being derived from the oxidation of the zinc element. When the reaction is the oxidation of a natural, or derived, fuel the term fuel cell is used. The theoretical efficiency of such a system calculated from the total free energy of the reaction, can be 100 per cent. It can indeed appear to exceed 100 per cent if heat is ignored which might be abstracted from its surroundings. An electric power station can never be 100 per cent efficient, since the thermal energy of the fuel is utilized in the inherently inefficient heat engine; even the most modern installations are only about 30 per cent efficient and their ability to exceed 40 per cent could scarcely be envisaged.

Many types of cell have been studied but, except for one or two of the examples discussed below, their characteristics suggest that they could never operate economically on a large scale. A direct cell, in which some form of solid carbon could be used as the anode, would have obvious potential advantages; in practice, however, indirect cells, using hydrogen or carbon monoxide as fuel, have proved more successful.

As early as 1839 Sir William Grove was able to demonstrate that, using dilute sulphuric acid as electrolyte and electrodes of activated platinum, hydrogen and oxygen would react to yield a small electric current. In 1889 a similar cell was developed by Mond and Langer and, although a current density of 6 A/sq ft of electrode was reached at an efficiency of nearly 50 per cent, further progress was prevented because the platinum electrodes used were too expensive. The concentration polarization* in this cell was very pronounced and in order to maintain efficiency the cell was depolarized at regular intervals by interchanging the streams of gas and thus altering the direction of the current.

In 1932, after an exhaustive study of the literature relating to fuel cells, F. T. Bacon decided that the hydrogen-oxygen system was the most promising. Since the time of Mond and Langer many new metals and alloys have become available at reasonable prices, as possible alternatives for the electrode material. By using electrodes of pure nickel F. T. Bacon has made substantial progress with this system and is at the present time continuing the research under the direction of Professor T. R. C. Fox at Cambridge, the programme being sponsored by the Electrical Research Association and the Ministry of Fuel and Power.

The cell at present in use at Cambridge (Fig. 1, British patent 667,298, 1950) consists of two porous nickel electrodes between which potassium hydroxide is circulated.



Vertical central section of electrode arrangement in the Bacon fuel cell

* A voltage drop due to changes in the uniformity of concentration of the electrolyte during operation of the cell.

The reacting gases, hydrogen and oxygen, enter the cell from opposite sides and an e.m.f. is generated between the two electrodes. The performance of the cell can be improved considerably by increasing the working temperature and pressure. By the end of 1950 a cell had been constructed which would operate at 300 A/sq ft at 0·79 V, which represented an efficiency of 60–65 per cent calculated from the free energy of the reaction and was obtained by raising the operating temperatures to 200 deg C and the pressure to 600 lb/sq in. The length of run was, however, severely limited by deterioration of the oxygen electrode after which the efficiency of the system fell off rapidly. Davtyan in 1947 published details of work carried out at the Academy of Science in Moscow, in which he claimed that, if the electrodes were made of activated carbon impregnated with various metals, an efficient hydrogen-oxygen cell could be produced which would work at room temperature. In view of the promising results published by Davtyan, the Electricity Supply Research Council initiated a research into this type of cell, the work being done by the British Electricity Authority under the direction of Dr. J. S. Forrest. The experiments so far completed have not been very encouraging, but an exhaustive examination of cells of the Davtyan type has not yet been made.

Other Experiments

Promising results with high temperature indirect cells were obtained in Germany some thirty years ago, notably by Baur and his collaborators, using hydrogen or carbon monoxide and air with molten salt electrolytes.

In 1932 patents were taken out in Great Britain and America by Dr. H. Greger for a fuel cell which was said to work very satisfactorily, using hydrogen, carbon monoxide or methane, and oxygen, the electrolyte being a complex mixture of carbonates and chlorides of sodium, potassium and barium, which melted at 600 degrees C. No information has been given concerning this system since 1938 when successful laboratory tests had encouraged the sponsors to the extent that they were considering the development of this cell on a large scale.

Details of a new development in the United States were recently given in U.S.A. Patents 2581650/1 granted to Dr. E. Gorin of Pittsburgh Consolidated Coal Co. and referred to in *Electrical World*, Vol. 137, p. 24, 23rd June, 1952. Highly reactive carbon is converted into water gas which is subsequently oxidized in the presence of solid electrodes and electrolyte to produce electricity as in the high temperature cell developed by Davtyan. The patent itself describes a method of using the heat produced in the fuel cell to preheat the air/steam mixture supplied to the gas generator. The article mentions that Government power experts are enthusiastic about the ultimate possibilities in, say, five or ten years' time. Efficiencies as high as 75 per cent are claimed, but so far the operating life has been short.

Research has been carried out by Dr. A. M. Posner at King's College, London, under the direction of Professor Sir Eric Rideal, on a fuel cell involving " Redox " processes. In this type of cell the anolyte and catholyte act as electron carriers and must be separated by some form of diaphragm. The electrolytes are regenerated by direct interaction of the anolyte with air and the catholyte with carbon. Various cells have been tested and some interesting results have been obtained.

There is still a considerable amount of work to be done on the mode of regeneration of the catholyte and the conditions necessary to obtain maximum activity of the carbon. Similarly, suitable catalysts are needed for accelerating the regeneration of the anolyte. The cell itself has not been as efficient as was originally hoped and it will be some time before any decision can be made regarding the possible use of a fuel cell involving " Redox " processes.

No summary of the development of fuel cells would be complete without mention of the attempts which have been made to build a cell in which a carbon anode could be oxidized electrochemically to produce an electric current. At room temperature carbon is very inert and cannot be ionized; thus, in order to promote the anode reaction, a direct cell must run at quite a high temperature. With electrolytes made from fused salts many difficulties are encountered, among which the most important are probably the corrosion due to the electrolyte and the volatilization of the electrolyte. Cells have been constructed with a solid conducting diaphragm separating the anode and the cathode instead of a molten electrolyte, but these cells polarize

rather badly. Baur (1941) claimed some success with high temperature direct cells, but it is very unlikely that this type of cell could be used on a commercial scale.

If a practical fuel cell is produced it will have to compete with several well established processes by which electrical energy can be generated. If the high efficiencies which have been obtained in laboratory tests could be produced on an industrial scale and, furthermore, if they could be maintained over long periods of time, then the fuel cell would immediately become a worthwhile practical proposition.

Modern techniques are already helping us to get a clearer picture of the basic principles involved and there are reasonable grounds for the belief that a satisfactory fuel cell can be constructed on a laboratory scale. The design of an economical commercial prototype is another matter and is likely to require considerable technical and material resources.

The possibility of using, say, a hydrogen-oxygen cell as a means of storing electrical energy (e.g., in conjunction with generators driven by wind power) should not be overlooked, since the incremental cost of kWh for a given kW output could probably be kept very low. A battery of such cells would probably have a much higher power-to-weight ratio than that of the lead accumulator and might also be developed for traction purposes.

A fuel cell would have to be more than 40 per cent efficient to compete economically with combustion methods of producing electrical energy and it would also have to use "fuels" which are readily available without expensive processing. Although the energy is produced as d.c. at low voltage, which is not convenient for transmission of large quantities of power, it is suitable for use in electrochemical processes, such as the electrolytic extraction of metals like aluminium and magnesium which are large consumers of electrical energy. To be practicable a suitable fuel cell would have to be robust, simple, cheap and capable of supplying adequate power for long periods.

The help given by Dr. J. E. Bowers in the preparation of this paper is gratefully acknowledged. The permission is acknowledged of the director of the E.R.A. to publish this paper.

[Bibliography

1. Allmand, A. J. and Ellingham, H. J. T.: "Principles of Applied Electrochemistry," Longmans Green & Co., Ltd., London, 1924.
2. Howard, H. C.: "Direct Generation of Electricity from Coal and Gas," "Chemistry of Coal Utilization," Chapter 35, Vol. 2, pp. 1568 to 1585 (Ed., H. H. Lowry; Wiley, New York, 1945).
3. McKee, J. H.: "Production of Electricity from Coal," monthly *Bulletin* of the British Coal Utilisation Research Association, Vol. 2, No. 7, July, 1945.
4. Davtyan, O. K.: "Direct Conversion of Chemical Energy of Fuel into Electrical Energy," Academy of Sciences, U.S.S.R., Moscow, 1947.
5. Ellingham, H. J. T.: "Direct Conversion of Chemical Energy to Electrical Energy," Chemical Energy in the Advancement of Science, Vol. 8, No. 29, 30–34, June, 1951.
6. Danckwerts, P. V.: "Fuel Cells," *Industrial Chemist* (March, 1952).
7. "Power through Heat," *Electrical World*, Vol. 137, p. 24, 23rd June, 1952.
8. R. G. H. Watson: "Fuel Cells," *Direct Current*, Vol. 1, No. 2, pp. 30–34 (September, 1952).

Note.—These references themselves contain lists of relevant papers, e.g., No. 3 has 39 references.

Aluminium Production

AT the invitation of Northern Aluminium, Ltd. (one of the Aluminium, Ltd., group of companies) we attended last week a private showing of a 32 minute colour film dealing with aluminium production. Explaining by means of photography and animated drawings the processes by which aluminium is extracted and fabricated, the film moves between British Guiana, Canada and Great Britain, concluding with a review of vast new projects for the mining and treatment of the ore in Jamaica and its reduction in British Columbia.

As its title of "Packaged Power" suggests, the film stresses the hydro-electric power developments which have made the smelting of aluminium economically possible. After describing the scheme by which the waters of Quebec's Saguenay River are harnessed to generate 2,000,000 h.p., the film strikingly shows the actual damming of the Peribonka River by dynamiting two 2,800 ton concrete blocks into position.

It is the British Columbia project, however, the greatest of its kind ever devised, that gives the film its climax. The flow of a chain of lakes and rivers will be reversed to provide a further 1,650,000 h.p. for aluminium smelting.

The Northern Aluminium Co. has issued a booklet entitled "About Aluminium," in which is reprinted a series of articles first published by the company in the advertisement columns of the technical Press. These articles are mainly a short account of specific physical and mechanical properties of aluminium.

Engineering in Europe

Survey of Current Literature

THE usual methods of prophylactic testing of moulded bushings filled with bituminous compounds and lead-in insulators on a bituminous base for up to 35 kV consist in measuring tan δ and in breakdown tests at a higher voltage; and of moulded bushings for up to 110 kV, in measuring tan δ and determining the voltage distribution on the outer porcelain body. This enables such defects as general dampness, ageing of the whole insulator and far developed defects of the moulded body to be detected, but does not reveal weaknesses in the compound filling, even if comparatively high voltages are used; all these tests are carried out at 50 c/s.

It is more efficacious to test the bushings at 1,000–1,100 c/s and 220–250 V, and to carry out breakdown tests at a high voltage with shrouding electrodes. The tests at 1,000–1,100 c/s can be carried out by means of a portable valve generator of 1–2 W output. Tests at the commercial frequency and at a high voltage with shrouding electrodes must be combined with the use of a partial-discharge indicator or defectoscope, because they are not conclusive without this.—"Prophylactic Testing of H.V. Insulators," by M. M. Nekrasov, *Elektrichestvo*, No. 6, pp. 15–19, 1952, in Russian.

Line Chart

A new type of line chart is suggested in which the relation between active and reactive power at the near and far ends of the line is particularly clearly seen, this being supplemented by a voltage diagram indicating the extent of possible operating ranges. The output diagram is no equivalent of Thieleman's or Fallou's diagrams because the latter include also the currents. Fallou's diagram, being only an approximation, may be plotted very quickly, whereas the construction of the author's diagram would take at least a full day.

On the other hand, the author's diagram answers any question concerning powers with precision and without further labour and thus makes the trial and error methods used in the evaluation of other diagrams superfluous. Since the diagram used is a vector diagram, questions of symbolism do not arise. The calculation of the losses in the usual way from the difference of powers at the near and far ends has to be carried out for many of the points of the line lest a considerable error be incurred.

The author presents a formula for calculating the losses with all the accuracy required, even if the calculations are made by slide rule. Alternatively, the formula may be conveniently graphed and yields then about the same accuracy of results without further calculation. The minimum losses at the far end are always obtained for the same reactive power, regardless of the active power transmitted. This reactive power is roughly equal to half the charging power of the line. The minimum losses are achievable only if the sending end voltage remains within given limits.—"Contribution to the Investigation of Power and Losses in a Long Transmission Line," by S. Pacak, *Elektrotechnicky Obzor*, Vol. 41, No. 7, pp. 309–317, July, 1952, in Czech.

Tests on Capacitors

Since the insulation of many elements of electrical plant is exposed in service to the simultaneous action of d.c. and a.c. voltages, the behaviour of the insulation under these conditions must be tested in order to establish the effects on the insulation characteristics, above all on service life, breakdown stress and dielectric losses. This applies particularly to capacitors, which are the type of circuit elements most frequently subjected to this type of stressing.

The tests may be carried out with a capacitance bridge of the type used for ordinary tan δ measurements, by a method in which two identical capacitor specimens and one standard capacitor are used, the two specimens being connected in parallel-opposition. This has the advantage that,

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

while both capacitors are simultaneously stressed by d.c. and a.c. voltages, the first of these does not affect the bridge instrument.

Where the a.c. supply is concerned, the capacitors are in series, and as their capacitances are equal, half the a.c. voltage applied will be dropped in each of them. The tests reported related to paper capacitors impregnated with various liquid dielectrics (mineral oil, "sovol" and organic silicon compounds).

General conclusions drawn were: tan δ of capacitors with low-viscosity impregnation falls to a minimum when d.c. and a.c. voltages are nearly equal and losses occur mainly in the liquid phase (when liquid contains ionic admixture). With highly purified, fairly low viscosity, impregnants, d.c. voltages produce an increase of tan δ, whereas with high-viscosity impregnants tan δ is unaffected by d.c. A tentative physical interpretation is given in "Measurement of the Dielectric Loss Angle under Simultaneous Application of D.C. and A.C. Voltages," by S. K. Medvedev, *Elektrichestvo*, No. 8, pp. 52–54, 1952, in Russian.

Industrial Development

Relationship of Electricity Consumption and Productivity

HOW electricity influences the productivity, hence the prosperity also, of the larger industrial nations was indicated by Mr. J. Prince (Meter Dept., Ferranti, Ltd.), in his address as chairman of the I.E.E. North-Western Centre.

The address commenced with an historical outline of the growth of scientific and industrial development and then pointed to some of the reasons why, as the consequence of two great wars in the last forty years, Great Britain's economic dominance in the industrial world had declined; investments overseas had had to be liquidated and less was earned by general commercial services of all kinds.

With the aid of a series of graphs Mr. Prince was able to show the relationships between the electrical energy consumed and the national productivity of various countries, including the United States, Canada, Australia, New Zealand, United Kingdom, Sweden, Union of South Africa, Mexico, Switzerland and Denmark. From these curves it seemed that in many cases the electrical energy curve was the first to reveal an increased rate of growth while the productivity curve tried to follow. Also similarly plotted were national income curves which indicated how the last war had caused declines in national incomes of most countries in Europe in contrast to the considerable increases in North America.

From 1946 to 1950 the rate of increase of industrial production in Britain was parallel with that of electrical energy; nevertheless the gross national income consistently declined. In the same period the Union of South Africa showed the largest annual rate of increase of electrical energy consumed; next came the United Kingdom and New Zealand, then Australia followed by the United States and Mexico. The amount of energy used per worker per hour was easily greatest in Canada, which fact could be accounted for by two industries, pulp manufacture and aluminium production, which utilized large amounts of electricity but employed relatively few workers.

Mr. Prince concluded with the observation that it had become very clear that in the present circumstances everyone in Great Britain was dependent on the success of the export proportion of the total trade of the country. It seemed, therefore, that the engineer must play an even greater part than ever before in the economic future of Great Britain. He stressed the need for greater productivity in all manufacturing methods in this country, including those of electrical engineering. It should be an industrial advantage for the average energy per man-hour to be increased in Great Britain more in line with countries of the North American Continent. A study of the past showed that the wealth of Britain was inherent in the ideas and developments of its scientists and engineers—this country was bereft of many of the materials which brought natural wealth, although further Commonwealth and Empire developments should eventually compensate for this.

VIEWS on the NEWS

By REFLECTOR

THE Electrical Trades Union journal *Electron*, while giving a kind of grudging general approval to the idea of better productivity, says that "the approach to the whole problem of increased productivity will sooner or later have to be considered in the light of Britain's changed economic circumstances." But surely it is just these circumstances which have heightened the need for improved productivity? *Electron* mentions as one factor intensified German and Japanese competition. Is it suggested that this lessens the need for improvement and that inefficient methods are more likely to prevail against such competition? If it is there is something queer about the journal's economics.

* * *

I am pleased to see that the *Birmingham Mail* has been reproved by Mr. A. S. Lowe, secretary of the B.E.A.M.A. Electricity Development Committee, for saying that "most domestic use of electricity is extravagant and wasteful and that, as a poor country, we cannot afford the luxury of having everything at the turn of a switch." Mr. Lowe objects to the very silly suggestion that the use of electricity is against the national interest and adduces the Ridley Report in support of his argument that the reverse is the case.

* * *

Scots, in the popular view, do not need exhortations to economize. When they are so exhorted they overdo it. At any rate that is what I gather from remarks made recently in Edinburgh by Lord Mathers, chairman of the Scottish Electricity Economy Committee. He said that the Committee was a "bit concerned" because some people seem to have taken its appeal to heart and had cut their consumption so much that there had been a fall in revenue and losses had been incurred by the Electricity Boards. The Committee, I fear, has found what others have discovered: that appeals for careful consumption during peak hours result in excessive economy at all times—or more probably the use of other services than electricity.

* * *

I have referred before to the unusual amity between Northern Ireland and the Irish Republic in the matter of the development of the power of the River Erne by the Irish Electricity Supply Board to provide electricity for people on both sides of the border. In a reference to the inauguration of the scheme, the London correspondent of the *Irish Press* (Dublin) says that Sir Samuel Ferguson, the Dublin poet and antiquary (1810–1886), would have grieved to visit Ballyshannon and not see the salmon leap over the weir as they did in his time. "But (the correspondent asks) isn't it better to have an Orangeman's house in Fermanagh lit up from over the border than to see a thousand salmon leap?"

* * *

It is clear that the *Electrical Review's* offer to act as a "clearing house" in the matter of electrical functions is not being generally accepted although, I am told, the response has been very good. I am prompted to this thought by a remark made by "Pilgrim Three" in the October issue of the *Electrical Contractor*. He says he finds that the Worthing Branch of the Electrical Contractors' Association has chosen 10th December as the date of its annual dinner-dance—a date already booked by the Kent Branches of the Association. If this can happen within an organization how much more difficult is it for different bodies to avoid clashing dates?

* * *

An *Evening News* reader suggests that electrically-heated flying suits could be modified to run off the domestic mains "and would prove much less wasteful than electric fires." There would probably be a need for flying suits on the part of people clothing themselves in this way.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IT is announced that **Mr. L. Bagrit,** who is managing director of Elliott Brothers (London), Ltd., and a director of Mutual Finance, Ltd., has been appointed to the board of Southern Areas Electric Corporation, Ltd.

Mr. C. W. Kelsey, chief purchasing officer of the London Electric Wire Co. & Smiths, Ltd., was elected president of the Purchasing Officers' Association at its twenty-first anniversary conference, recently held in Harrogate. Mr. Kelsey is one of the two founder members of the Association and is the first member of the P.O.A. to hold this office for a second time; he was president in 1938-39. He joined the London Electric Wire Co. & Smiths, Ltd., in 1928 as purchasing officer at the Leyton works, and was previously assistant buyer with the British Electric Transformer Co., Ltd., from 1920 to 1928. The new chairman of the Association is **Mr. F. J. White** (Chance Bros., Ltd.), with **Mr. H. H. C. Wood** (Igranic Electric Co., Ltd.), as vice-chairman.

Mr. C. W. Kelsey

Mr. P. F. Grove, M.A., M.I.E.E., has left Messrs. John Miles & Partners (London), Ltd., and has joined Messrs. McLellan & Partners, consulting engineers, in their London office at 32, Victoria Street.

Mr. Arthur E. Aird, works superintendent of No. 1 Sub-Area of the Merseyside and North Wales Electricity Board, was presented with a Royal Worcester dinner service on his retirement on 15th October. He started his career as an apprentice wireman with the Liverpool electricity undertaking in 1903.

Mr. J. N. Baker has succeeded **Mr. S. C. Irving** as deputy station superintendent at Poole generating station. Mr. Baker, who was previously maintenance superintendent at Poole, entered the electricity supply industry in 1936 when he was appointed charge engineer at Fulham station, where he later worked as assistant maintenance engineer from 1940 to 1946. He went to Blackburn Meadows station, Sheffield, as repair and maintenance engineer in 1946, being appointed mechanical maintenance engineer at Brighton station in the following year. Mr. Baker was appointed maintenance superintendent at Poole in December, 1950.

The Metropolitan-Vickers Electrical Co., Ltd., announces the appointment of **Mr. R. Allen,** Assoc. M.C.T., A.M.I.E.E., as manager of the Birmingham district office as from 1st October, in succession to **Mr. A. F. Bock,** who has retired.

Mr. Allen was educated at Manchester Grammar School, and joined the then British Westinghouse Co. as a trade apprentice in 1916, winning the company's scholarship to the Manchester College of Technology. In 1921 he joined the Motor Engineering Department, and in 1926 transferred to the General Engineering Department, where he dealt with industrial electrification schemes. In 1947 Mr. Allen moved to the M-V Birmingham office as senior plant sales engineer handling switchgear, transformers, rolling mill equipment, colliery equipment, etc.; he was appointed assistant manager in May of this year.

Mr. Bock had been with the company for forty-five years, for twenty-six of which he was manager of the Birmingham district office. He went to the Trafford Park works in the early days of British Westinghouse, and after serving a college apprenticeship from 1907 to 1910, he joined the Plant Department. He served in the 1914-1918 war, enlisting as a private and rising to the rank of captain. Mr. Bock returned to the Plant Department after the war, and towards the end of 1921 went to South America; he was stationed at Valparaiso and represented the company in Chile and Peru during the next four years. On his return to

Mr. R. Allen

Mr. A. F. Hock

this country he was attached to the company's London office, and in 1926 he was appointed manager of the Birmingham office, a position he continued to hold until his retirement.

Mr. C. Greenhalgh, Associate I.E.E., managing director of C. Greenhalgh (Electrical), Ltd., wholesale electrical suppliers, Burnley, who for the past five years has commanded the 50 A.A. Workshops Coy., R.E.M.E. (T.A.), with headquarters at Accrington, Lancs, has been appointed to the command of the 15 A.A. Workshops Battn., R.E.M.E. (T.A.), with headquarters at Clifton, Manchester, with the rank of lt.-colonel.

Lt.-Col. C. Greenhalgh

Mr. J. E. N. Davis, chief organization officer of the National and Local Government Officers' Association, has been appointed vice-chairman of the National Joint Managerial and Higher Executive Grades Committee for the Electricity Supply Industry.

Prof. F. C. Thompson, Professor of Metallurgy, University of Manchester, has been elected as president of the Institute of Metals with effect from the 1953 annual general meeting.

Sir Robert Gould, C.B., Chief Industrial Commissioner, has retired from established service in the Ministry of Labour and National Service but is continuing as Chief Industrial Commissioner, in a temporary capacity, for a short period not extending beyond the end of the year. He will be succeeded by **Mr. H. G. Gee,** C.M.G.

The Duchess of Gloucester paid a visit to the recent Nursing Exhibition organized by the *Nursing Mirror*, and was particularly interested in the display of the British Electrical Development Association. In the accompanying picture she is seen at the E.D.A. stand with Sir Cecil Wakeley, president of the Royal College of Surgeons.

Mr. H. L. Cottam, deputy superintendent of the Percival Lane power station, Runcorn, who retires at the end of October, has been presented with a wrist-watch from his colleagues. The presentation was made by Mr. J. E. Nelson, former managing director of the Mersey Power Company. Mr. Cottam has been in the electrical industry for 51 years and at the Percival Lane power station for 31 years.

Sir Charles Colston, C.B.E., M.C., D.C.M., chairman and managing director of Hoover, Ltd., and Lady Colston, left for Johannesburg by B.O.A.C. Comet airliner on 19th October.

Mr. Charles Worswick, superintendent of street lighting, Oldham, who was due to retire at the end of this year, has had his term of service extended for a further twelve months.

Last week the **G.E.C. Dramatic Society** gave three performances of M. C. Hutton's "fantastic comedy," *The Happy Family*. The theme of this play is the successful struggle of a "little man" and his relations against Governmental authority seeking to sacrifice his house to make a Festival Exhibition road. The players successfully struggled to make something of not very good material; they were led by the Society's "veteran" actor-producer, William Peacock as Henry Lord (the little man). His wife was adequately played by Florence Scantlebury. Government was represented by Miller Dixon as Herbert Filch and the B.B.C. by Ronald Palmer as Morris Hennessy. Members of the family, who all did well in their various parts, were Shirley Linge, Jean Freeman, Jean Wilson, Keith Clifton, James Wilson and Doreen Webb. The proceeds are being passed on to the Electrical Industries Benevolent Association.

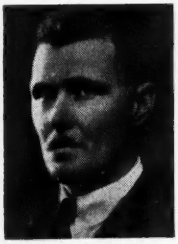
Mr. T. C. Struthers, B.Sc., has been appointed Hull district engineer to the No. 6 Sub-Area of the Yorkshire Electricity Board, to succeed **Mr. G. W. Mitchell,** A.M.I.E.E., the new Sub-Area engineer.

At a golden jubilee cocktail party held in the staff canteen of Bushbury Engineering Works of the **Electric Construction Co., Ltd.,** on 15th October, the guest of honour was **Mr. W. M. Furniss,** chairman and managing director of the company, to mark his fiftieth year with the company. Mr. Furniss joined the company in 1902 as sales engineer, becom-

The Duchess of Gloucester at the E.D.A. stand at the Nursing Exhibition

ing general manager in 1915, director and manager in 1926, and managing director in 1942, combining this latter office with the chairmanship of the company in 1948. Of those present 17 had had 50 or more years' service with the company.

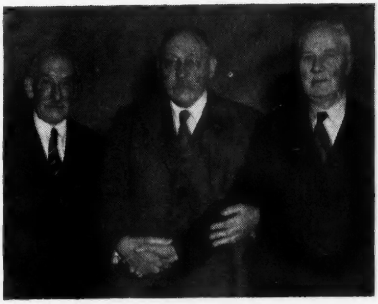
In our last issue we reported the appointment of **Mr. S. A. Clarke** to the board of Gent & Co., Ltd. Mr. Clarke has been progress manager of the company for many years and is a member of the Leicester Association of Engineers.



Mr. S. A. Clarke

On 11th October the directors of **Higgs Motors, Ltd.**, gave a dinner to senior employees at the Grand Hotel, Birmingham. About 400 guests were present and the occasion was marked by the celebration of the company's fortieth birthday. Toasts and replies were given by Mr. Walter Higgs (chairman), Mrs. Walter Higgs, Mr. E. A. Norton (deputy chairman), Mr. D. Higgs, Major S. J. J. Vaughton and Mr. J. Jacobs. Presentations of long service awards were made to Mr. F. B. Holt (local director and Manchester manager), Mr. J. B. Peedle (local director and Glasgow manager), Major Harriss and Messrs. Jacobs, Lindsey, Robinson, Jenks and Allen of the Witton Works and staff.

Newey & Eyre, Ltd., recently celebrated their silver jubilee with a dinner at the Queen's Hotel, Birmingham. With the chairman, Mr. F. Vincent Everard, and the managing director, Mr. R. A. Corbett, were their co-directors and 120 members of the staff, with their wives or husbands. The date coincided with Mr. Corbett's fiftieth birthday, and he



Mr. W. M. Furniss, chairman and managing director of the Electric Construction Co., Ltd., with Mr. Tom Parkins (58 years' service) right, and Mr. James Lee (62 years' service) left

was presented with a silver salver by the directors and a silver tea service from the staff. The toast of the company was proposed by Mr. Rodney Pollard, secretary, Thomas Tilling, Ltd., and seconded by Mr. H. A. Keeling. In replying to the toast, Mr. Corbett reviewed the company's history.

Competing against thirty-one teams at the annual tournament of the London Private Fire Brigades' Association, held recently at the works of Standard Telephones & Cables, Ltd., New Southgate, the Works Fire Brigade of the **Micanite & Insulators Co., Ltd.**, won for the third consecutive year both the Nestlé Cup awarded for the Private Fire Brigade Championship of the United Kingdom, and the Marshall Cup, the award for the championship of the Association's First Division.

Members of the Publicity Committee of the Electric Lamp Manufacturers' Association recently gave a farewell dinner to **Mr. H. E. Goody** at the Trocadero, London. Mr. Goody, who was a permanent member of the Committee, retired from the position of lamp and lighting advertising manager with B.T.H. in July. Seen speaking in the accompanying picture is Mr. R. E. Hesketh (G.E.C.) with Mr. and Mrs. Goody on his right. On the left is the new manager of "Mazda" advertising, Mr. O. W. J. Farmer. Also present at the dinner were Messrs. E. B. Sawyer (Lighting Service Bureau), W. J. Jones (E.L.M.A.), F. J. Addington-Hall (Philips), McK. E. Tatchell (Ediswan), H. R. Mallett (Siemens), and Miss N. E. Miller (Ediswan).

A group at the E.L.M.A. dinner to Mr. H. E. Goody

For ten minutes last week in the television programme "About the Home," **Miss Joan Gilbert** (B.B.C.) and **Miss Mary Gilbert** (E.D.A.), talked over eight of the newest electrical appliances of interest to the housewife. Included were—the "Tiffee" automatic tea maker; the Morphy-Richards light weight iron; the "Mix Maid" portable mixer; the "Tucker-Simmerstat" switch socket; the "Dimplex" oil-filled radiator; and the G.E.C. radio alarm. The accompanying picture was taken during rehearsal.

Miss Joan Gilbert, assisted by Miss Mary Gilbert (E.D.A.), presents new electrical appliances

Hoover, Ltd., has announced the following appointments in the sales-service organization:—**Mr. G. Wall** to be North-East branch manager, with headquarters at Leeds; **Mr. E. Johnson** to be district manager, Hendon; **Mr. R. G. Evans** to be district manager, Ealing; and **Mr. H. A. Assinen** to be district manager, Brighton.

Mr. H. V. Henniker, M.I.E.E., has retired from the office of joint hon. secretary of the Scottish Centre of the Institution of Electrical Engineers after serving in that capacity and, earlier, as assistant hon. secretary for twenty-five years. It is proposed to make a presentation to Mr. Henniker at the next Edinburgh dinner of the Centre.

Mr. J. M. Waldram, a past-president and Fellow of the Illuminating Engineering Society, has been made a Fellow of the American I.E.S. The presentation of the certificate was made to Mr. Waldram by Mr. J. G. Holmes at an I.E.S. meeting at the Royal Institution on 14th October. In acknowledging the presentation Mr. Waldram said that though the award had been made to him personally, he felt that it was made in recognition of the work done in this country and was something in which all members of the I.E.S. could share. At the same meeting **Prof. J. T. McGregor Morris** was handed his certificate of hon. membership of the I.E.S.

The second annual open day at the Trafford Park works of **Lancashire Dynamo & Crypto, Ltd.,** was held on Saturday last when 1,000 employees, relatives and friends toured the plant. At strategic points throughout the tour volunteers who were engaged at their normal jobs explained the technicalities of their every-day work to the visitors.

Mr. A. J. D. Langford, M.A.(Cantab.), solicitor and deputy secretary of the East Midlands Electricity Board, has resigned and is going into private practice at Luton. **Mr. L. V. Ellison,** who has been assistant solicitor for the past three years, has been appointed solicitor to the Board.

Left: **Presentation of certificate of fellowship of the American I.E.S. to Mr. J. M. Waldram by Mr. J. G. Holmes. On the platform are Mr. H. C. Weston (hon. secretary, I.E.S.), Dr. W. J. Wellwood Ferguson (president) and Mr. G. F. Cole (secretary).** *Right:* **Mr. Holmes presenting Prof. J. T. McGregor Morris with the certificate of hon. membership of the British I.E.S.**

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Ramsay Centenary

I HAVE read the note in the *Electrical Review* of 10th October in connection with the Ramsay Centenary appeal for £100,000 for laboratory extensions at University College, London.

This appeal, which has been given nation-wide publicity in many daily papers and periodicals throughout the United Kingdom, seems to the reader to have a curious omission, to wit, that young Mr. Ramsay spent some four years as a student at Glasgow University, the following year at Tübingen, and the next nine years at Anderson College, Glasgow, an extra-mural college of Glasgow University, before he set out for Bristol and ultimately University College, London.

I, *Civis Universitatus Glasguensis*, cannot but surmise that if, perhaps, part of the £100,000 were invested in extending Glasgow University chemistry laboratories, another young Mr. Ramsay might be nurtured in his native soil before blossoming into maturity across the Border in the proposed new laboratory extensions in University College.

Richmond, Surrey. JAMES MCCASH.

Electrically-Wound Clocks

IT really is astounding that British manufacturers of electric clocks have never seen the serious shortcomings of synchronous clocks, and especially so since the war in a country where load shedding occurs each winter and is likely to continue from all accounts for many years to come.

An ordinary good quality clockwork movement with a 12 or 24 hour spring, electrically wound, would appear to be the answer for people living in the United Kingdom or countries all over the world where electricity supply systems cannot be relied upon to maintain continuous supply or accurate frequency control. A simple eddy current motor with a brake coupled with the clockwork spring is all that would be necessary for any frequency between 25 to 60 cycles providing a wide scope and demand with obvious possibilities in our all-out export drive.

Lebanon. Y.E.D.

Loughborough College

THE Minister of Education is relieving the Leicestershire local education authority of the financial responsibility of maintaining the Science and Engineering Departments of Loughborough College, which are to be organized as a separate establishment to be styled the Institute of Technology, Loughborough College, and to be maintained principally by grant from the Exchequer.

The cost of tuition and residence at this well-known College has risen so rapidly as to constitute a burden on Leicestershire ratepayers which the local education authority cannot any longer justify in view of the small number of Leicestershire students in attendance—about 50 out of a total of more than 800. For this reason the Minister was asked to assume the financial responsibility and in view of the exceptional circumstances of the case he has acceded to the request, the local education authority agreeing to make an annual grant of £15,000 towards the cost of the College.

A governing body to control the new Institute has been set up by the Minister; its members have been nominated by the Engineering and Allied Employers' Federation, the General Council of the Trades Union Congress, the Institutions of Civil, Mechanical, Electrical, Production and Chemical Engineers, the Royal Aeronautical Society, the University of Nottingham, the Association of Technical Institutions, the Leicestershire local education authority and the Minister of Education, with Sir Harold West (managing director, Newton Chambers & Co., Ltd., Sheffield) as chairman.

The buildings and equipment used by the Science and Engineering Departments have been transferred to the governors, together with a large new building now being erected and a number of hostels. The teaching and other staff have also been transferred to the service of the new governing body, which assumed its responsibilities on 1st September.

OVERSEAS ELECTRICAL TRADE

Analysis of September Figures

ALTHOUGH the value of exports of electrical apparatus and machinery in September, at £13,602,057, was £414,812 above the August figure, this does not represent any real improvement for last month contained one more working day. Moreover a decline of £233,507 is shown compared with the total of £13,835,566 recorded for September, 1951.

As Table I reveals, there was a deterioration in trade in roughly two-thirds of the categories listed. It will be noticed that actually the totals for electrical goods and apparatus and also for electrical machinery both show slight increases compared with the corresponding month of last year. This advance is, however, more than counterbalanced by severe declines in shipments of washing machines (from £722,204 to £331,609), vacuum cleaners (from £378,952 to £90,258) and "other electrically operated portable appliances and parts" (from £289,129 to £109,664).

One bright spot in the market was the

TABLE I.—ELECTRICAL EXPORTS

Class	Sept., 1951	Sept., 1952
	£	£
Telegraph and telephone cables and wires (submarine)	—	33,015
Ditto, not submarine	336,842	769,203
Wires and cables, paper insulated	568,474	895,606
Ditto, rubber insulated	556,557	466,912
Ditto, cotton, silk or artificial silk insulated	52,852	59,899
Ditto, enamel, glass or asbestos insulated	57,827	64,869
Ditto, other	205,922	280,410
Commercial radio apparatus	453,550	751,314
Domestic radio apparatus	402,477	364,764
Telegraph, telephone and signalling apparatus	1,324,295	1,134 538
Radio loudspeakers	53,906	44,363
Telecommunication components, n.e.s.	500,363	296,252
Other telecommunication apparatus	134,107	266,155
Valves and cathode-ray tubes	308,768	297,661
Carbons	26,594	10,749
Lamps, exceeding 24 V	103,484	57,782
Ditto, not exceeding 24 V	47,485	16,311
Other lighting appliances	397,652	391,446
Primary batteries	209,243	164,428
Parts other than carbons	31,997	18,915
Accumulators for motor vehicles	347,355	118,675
Ditto, traction	43,851	7,392
Ditto, radio	3,210	2,874
Other portable accumulators	70,053	49,210
All other accumulators	70,421	33,570
Parts and accessories	93,639	48,083
Cooking appliances	213,870	74,953
Heating appliances	84,980	66,178
Parts and accessories for cooking and heating appliances	69,378	80,602
Flat irons	81,295	45,601
Commercial electrical instruments	98,558	104,056
House service meters	134,843	90,624
Time recorders and time switches	27,300	12,952
Other electrical instruments	88,805	130,937
Electro-medical apparatus (not X-ray)	46,693	39,178
X-ray apparatus, tubes and parts	127,270	124,676
Permanent magnets	20,901	34,564
Insulating cloth and tape	114,633	39,285
Other insulating materials	87,447	76,119
Unclassified electrical goods and apparatus	467,334	699,101
TOTAL, electrical goods and apparatus	8,064,531	8,263,255
Diesel driven generators not exceeding 200 kW	334,182	322,092
Ditto, exceeding 200 kW	81,849	136,835
Other generating sets	423,790	71,127
Generators exported without prime movers, and parts of generators	429,992	868,990
Motors, railway, tramway and trolley bus	—	2,558
Ditto, other, not over ½ h.p.	104,881	104,061
Ditto, over ½ h.p. but under 1 h.p.	76,429	43,406
Ditto, from 1 h.p. to 250 h.p.	452,573	406,057
Ditto, exceeding 250 h.p.	64,604	105,279
Ditto, parts	80,619	77,199
Converting machinery	8,140	21,618
Transformers, including coils	632,935	859,102
Rectifiers for power house use	16,785	42,832
Motor starting and controlling gear	186,451	182,215
Switchgear and switchboards (not telegraph and telephone)	1,097,786	1,155,102
TOTAL, electrical machinery	3,991,016	4,378,383
Washing machines (not exceeding 250 lb weight)	722,204	331,609
Ditto, parts	30,276	41,563
Vacuum cleaners	378,952	90,258
Ditto, parts	28,821	31,022
Other electrically operated portable appliances and parts	289,129	109,664
Portable electric tools	84,730	73,571
Unspecified electrical machines, machinery and parts	245,907	282,732
GRAND TOTAL	13,835,566	13,602,057

cable section in which all classifications except rubber insulated show improvements. South Africa accounted for £154,253 worth of the £769,203 telegraph and telephone cables and wires (other than submarine) exported, with New Zealand (£79,078) the next best customer. India (£316,547) and Australia (£146,389) between them took approximately half of the total value of paper insulated types exported (£895,606).

Substantially larger sales of commercial radio apparatus (£751,314, compared with £453,550) more than made up for a decline from £402,477 to £364,764 in domestic radio exports. The decline from £368,228 to £221,733 in overseas purchases of cooking and heating appliances reflects the virtual closing of the Australian market, where purchases amounted to only £12,011 compared with £135,102 a year ago.

With regard to exports of electrical goods and apparatus as a whole Table II indicates that India (£831,266) now rivals South Africa (£860,968) as our best market, with Australia (£617,171) only third. Canada doubled its demands, taking goods to the value of £310,043 compared with £156,348, while Turkey and Sweden were also among those who substantially increased their purchases (from £68,567 to £301,837 and from £240,774 to £354,544).

Though severely restricted for consumer goods, the Australian market still provides the biggest overseas outlet for electrical machinery as a whole, £263,442 worth of generators, £107,245 worth of motors and £648,438 worth of other machinery being shipped there last month. Canada (£319,687) was, however, the biggest buyer of generators, while South Africa (£113,382), accounted for most motors, but Australia's purchases of "other electrical machinery" were more than the total of both the next largest customers, South Africa (£282,960) and India (£281,891).

Table II.—Distribution of Electrical Goods and Apparatus

Destination	Sept., 1951	Sept., 1952
Channel Islands	43,252	45,905
Gibraltar	6,936	9,428
Malta and Gozo	9,576	5,782
Cyprus	21,991	47,996
British West Africa	88,413	169,065
Union of South Africa	704,293	860,968
Northern Rhodesia	31,233	27,776
Southern Rhodesia	145,220	142,239
British East Africa	213,378	260,212
Bahrein, Qatar and Trucial Oman	60,726	26,390
Kuwait		66,693
India	681,085	831,266
Pakistan	184,619	124,306
Malaya	476,854	302,796
Ceylon	116,556	78,844
Hong Kong	162,453	81,807
Australia	1,188,781	617,171
New Zealand	466,337	431,145
Canada	156,348	310,043
British West Indies	90,393	115,012
Anglo-Egyptian Sudan	37,237	64,192
Other Commonwealth Countries	57,136	119,065
Irish Republic	275,392	251,432
Soviet Union	10,583	13,158
Finland	69,918	88,549
Sweden	240,774	354,544
Norway	151,543	101,332
Iceland	18,424	5,513
Denmark	80,587	67,126
Poland	15,378	25,499
Germany	22,288	103,624
Netherlands	189,200	198,022
Belgium	90,044	125,336
France	73,937	124,160
Switzerland	48,023	40,222
Portugal	58,757	88,341
Spain	69,652	43,407
Italy	81,361	88,628
Austria	13,160	64,674
Czechoslovakia	7,916	3,300
Greece	36,121	80,551
Turkey	68,567	301,837
Portuguese East Africa	27,769	12,169
Syria	20,877	18,797
Lebanon	32,232	43,460
Israel	29,394	74,263
Egypt	191,544	104,673
Arabia	13,505	32,234
Iraq	116,015	136,334
Iran	49,156	16,102
Burma	32,282	51,193
Thailand	53,444	39,464
Indonesia	7,524	54,000
China	2,732	191
United States of America	93,893	87,463
Venezuela	21,443	117,356
Peru	26,159	24,955
Chile	11,395	28,186
Brazil	213,504	95,009
Uruguay	30,476	18,847
Argentine Republic	283,011	22,167
Other Foreign Countries	243,734	379,096
Total	8,064,531	8,263,255

Contract Price Formulæ

THE British Electrical and Allied Manufacturers' Association has issued the September figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 18th October is deemed to be 134s. The "cost of material" figures are as follows:—

For electrical machinery and equipment: the Board of Trade index figure published on 18th October is 168·3.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 151·4; blast furnaces and iron and steel smelting and rolling (40 and 41), 142·2; price of ⅜in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 17th October), 3s 11½d.

Outstanding contracts covered by the Board of Trade intermediate products index: The index figure for intermediate products (18th October) is 361·0.

Radio Engineers

Need for Sectionalization of Institution

IN his presidential address to the British Institution of Radio Engineers, delivered at the recent annual general meeting in London, Mr. W. E. Miller, M.A. (Cantab.), outlined some of his ideas of possible lines on which the Institution might develop. The president pointed out that the diversity of radio and electronic developments had added new problems to the many which the B.I.R.E. had to face and should, from now on, engage the attention of those responsible for moulding its future activities.

When the B.I.R.E. was formed in 1925 radio engineering, though allied with electrical engineering, nevertheless had its own individual technical problems, most of which were distinct from those encountered in heavy electrical engineering. Therefore early members had a common interest and, though working perhaps in widely separated spheres, at least they spoke the same technical language and were able to understand each other's work and problems.

Changed Conditions

As radio engineering became recognized as a separate and distinct profession, specialization brought with it new ideas and intricate circuitry which made it virtually impossible for any one engineer to be an authority on any but a few of the aspects of radio and electronics with which he himself was closely concerned. Thus the average B.I.R.E. member began to experience difficulty in understanding and profiting from all the Institution proceedings; members as a whole became increasingly unable fully to grasp developments in other phases of radio engineering than those in which they were themselves engaged.

The widening gap between specialists was a bigger problem for the B.I.R.E., which served a relatively new industry, virile and making rapid technical progress, than for the older institutions. Indeed, the subtleties of some of the latest electronic developments had caused the president to wonder whether difficulties were not being experienced in expressing them in plain English. Engineers had, therefore, been obliged to employ their own brand of shorthand—namely, advanced mathematics—for communicating their ideas and conclusions, but specialist groups were now beginning to find it less easy to follow each other's mathematics.

Was the correct policy being pursued? Was the B.I.R.E. completely fulfilling one of its major objects—the dissemination of knowledge—if it provided proceedings from which only a proportion of members were able to profit? The president's suggestion, then, was that in addition to the specialized papers which the B.I.R.E. must continue to attract there should be published regularly, say once a year, a number of survey papers recording notable developments in every main branch of radio and electronic engineering so that all sections could combine to hear the more general survey papers while sectional papers, though open to all, would be mainly heard by the specialists in particular sections.

Thus the Institution had almost arrived at the stage at which it needed to have specialist sections. Moreover, the president considered territorial sectional interests to be of the highest importance, and he hoped during his year of office to extend that side of the Institution's activities by encouraging the formation of sections wherever there were sufficient concentrations of members to justify that course.

Insurance Journal

WE have received a copy of the first issue of "British Insurance" which is described as "a digest for industry and commerce." Its aim is to act as an interpreter of insurance to the prospective customer. All aspects of the subject are covered—marine, burglary, group pensions, professional indemnities—and this issue contains an article on the London Assurance and a number of book reviews. The journal is published at 1s (14s per annum including postage) by the Insurance & Printing Co., 5, New Bridge Street, London, E.C.4.

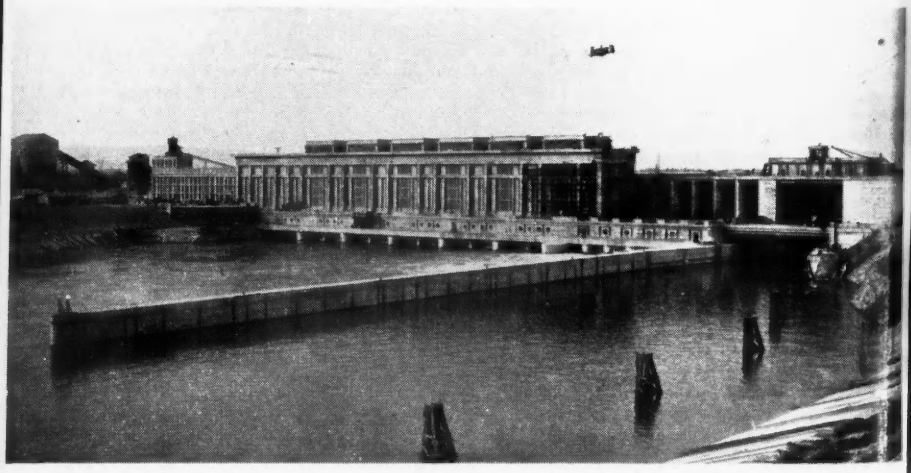
French Hydro-Electric Power

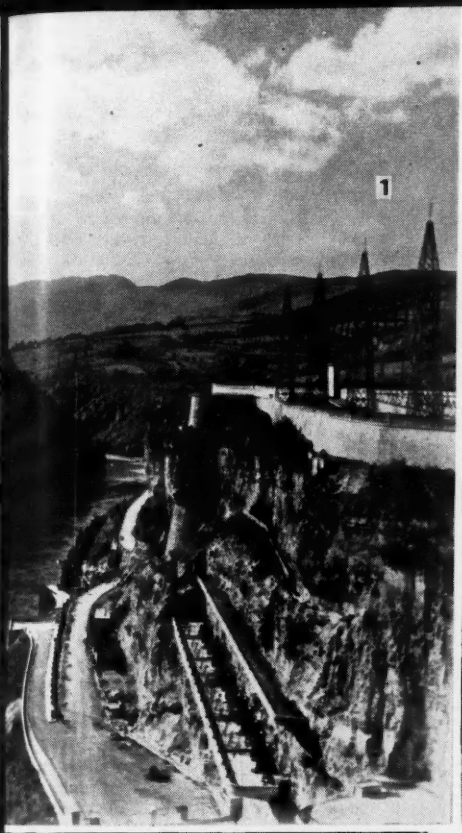
Inauguration of Rhône Power Station

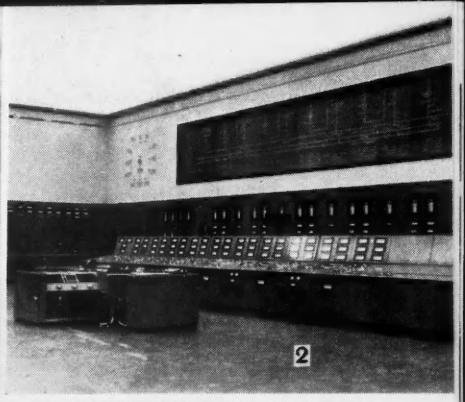
A FURTHER stage in harnessing the River Rhône in France from the Swiss frontier to the sea will be reached to-morrow (Saturday) when President Auriol inaugurates the new diversion canal from the Rhône between Donzère and Mondragon and opens the new power station and lock at Bollene. To carry out this project the Compagnie Nationale du Rhône, in which the French National Railways own 25 per cent of the shares, was formed.

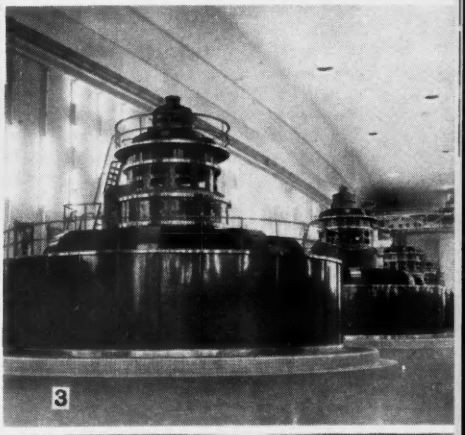
Broadly speaking, the scheme has three main objectives: to increase electricity production, to improve navigation on the river, and to assist agricultural production by better irrigation in the Rhône Valley. The first of the twenty dams which are to control the Rhône is already functioning at Genissiat, near the Swiss frontier. The second hydro-electric station, the largest in Western Europe, will soon be operating at Bollene. When the scheme has been

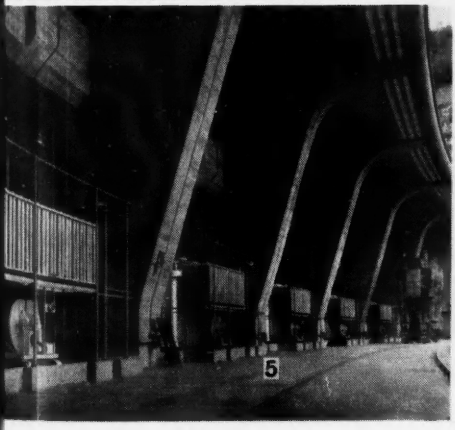
The power station and lock at Bollene also fulfil the purpose of a dam 1,115ft in length. *Left:* **The almost completed turbine hall**











The Genissiat scheme 31 miles from Geneva. (1) General view of the dam and power station. (2) Automatic control room. (3) Main generating hall, and below (4), some of the five 100,000 h.p. turbines. (5) The transformers comprise one of 5 MVA 5/15 kV and six of 0·5 MVA 5 kV/400 V

completed the twenty power stations will have a total capacity of about 2,500 MW and an annual production of 13,000 million kWh.

At the Genissiat dam and power station an artificial lock has been formed which provides water storage capable of producing 1,690 million kWh per annum. The installation comprises five generating plants with a total capacity of 325 MW and the work included the diversion of the river by means of two tunnels driven through the sides of the gorge. All the generator switchboard and control gear is automatic.

The Donzère–Mondragon undertaking has involved the construction of a canal to by-pass the river. A water intake has been constructed at the outlet of the Donzere defile and the 17-mile diversion canal short-circuits 19 miles of the river between Donzère and Mornas. The water intake consists of a reservoir dam and this raises the water level by 16ft for a distance of 6 miles. Two entries have been made to the diversion canal, one leading to the power station at Bollene and the other, which is for navigation, will use the new lock adjoining the power station. The canal is 475ft wide and has been enclosed by embankments.

The single block of power station and lock at Bollene fulfils the purpose of a dam between the headrace canal and the tailrace, the whole block being 1,115ft long and 193ft high. The station is equipped with six variable pitch Kaplan turbines each taking water at the rate of just over 9,000 cu ft/sec. Each is coupled to a 107 r.p.m., 50 MW, 10·5 kV alternator. Power is taken from here to a nearby transforming station where it is stepped up to 60 kV for the Lyons–Marseilles railway and to 220 kV for connection to the French grid. The annual production from the station will be 2,000 million kWh, half of which will be generated during the winter. The lock is the highest in the world at 85ft and is 639ft long and 39ft wide. The speed of lowering or raising the water level in the lock basin is 5·25 ft/min.

Railway electrification is of great importance to France since she lacks coal. The energy potential of hydro-electric plant has increased by a half in the last five years and to-day 2,672 miles of track are electrified. Electrification of the main Paris–Lyons line has recently been completed and 120 trains go through every day. On this line the new electric locomotive CC7101 is reported to have a running time of 4 hr 15 min for the 318 mile journey, in this way saving 65 min on the 1939 time. This has become the fastest train in Europe. On this particular line 231 electric locomotives have replaced 600 steam driven ones. The developments on the Rhône now make possible the electrification of the line between Paris and Marseilles via Lyons.

Waves and Fluctuations

I.E.E. Radio Section Chairman's Address

WHEN he delivered his inaugural address as chairman of the Radio Section of the Institution of Electrical Engineers in London last week, Dr. E. C. S. Megaw (Royal National Scientific Service) spoke about waves and fluctuations, and illustrated his remarks by means of lantern slides and a number of demonstrations. He chose this fundamentally important topic of research to illustrate the continuing interaction between radio engineering and the main stem of physical research in which radio had its origin and which it has frequently helped to refresh.

Although the natural language of Dr. Megaw's subject was mathematics, he expressed himself particularly well in words and started by discussing periodic and random phenomena in radio engineering, passing on to fluctuations in radio wave propagation.

As all applications of radio depend on the transmission of waves through the earth's atmosphere and may depend critically on its physical structure, he dealt with turbulence and refractive index fluctuations, after which he discussed at some length wave propagation through slightly inhomogeneous media and intensity fluctuation or scintillation. The chairman concluded by talking about long range propagation of radio waves by atmospheric scattering.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

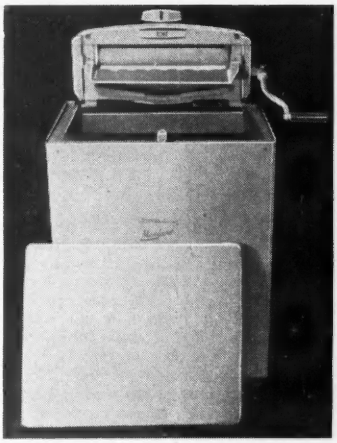
Washing Machine

IN the "Marpool" washing machine, for which SHERWOOD SALES, 11, Broad Street, Nottingham, are the sole selling agents, air is pumped into the washing chamber through a number of injectors, causing agitation of the water and clothing. This patented "Air-Wash" system is claimed to wash completely the full capacity of the machine (7–8 lb of dry wash) in five to seven minutes. There being no moving parts in the washing chamber, wear and tear on clothing during washing is eliminated.

Both the cabinet and washing chamber, which is finished in cream cellulose enamel, are constructed of 20 gauge aluminium and there is therefore no risk of rusting.

A standard 16in Acme wringer is locked into position by a simple "one-movement" locking bar and, when not in use, is lowered into the back of the machine thereby converting the washer into a neat kitchen table. The overall size of the cabinet with wringer folded down and the table top in position is: height 30½in, width 24in, depth 20in.

The price of the standard model is £23 6s 7d (plus £9 11s 7d purchase tax in this country). For a cabinet in other colours than cream the charge is slightly more.



"Marpool" clothes washing machine

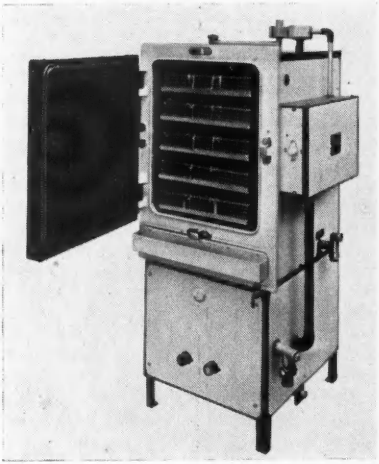
Steaming Oven

The "Creda" HC.5290 steaming oven brought out by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham, is equally suitable for puddings, potatoes, meat, fish, etc., and when cooking is finished can be used for sterilizing the pots and pans. It will steam 1 cwt of potatoes in 35–45 minutes.

The door and door frame are of cast iron, while the oven interior is constructed of heavy gauge tinned copper suitably reinforced, the whole being double cased and lagged. Five robust tinned wire baskets with reinforced frames are carried by hanging racks which are removable, leaving the interior free to facilitate cleaning. The oven exterior is finished in silver-grey vitreous enamel.

The oven operates at a slight pressure, the release valve in the top of the oven being fitted with a plunger set to operate at a pressure of 8 oz. The "Creda" pressure switch operates between 4 and 6 oz, thus ensuring the correct oven temperature with the maximum of economy. The water well, fed by an integral cistern fitted with a low pressure ball valve, is heated by three 3 kW immersion heaters, the

"Creda" HC.5290 steaming oven

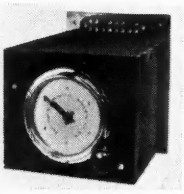


centre one being fitted with an automatic cut-out which operates should the water level drop to an unsafe level.

The overall dimensions of the oven are: front 31¼in, side 28¼in and height 58in. The weight is 616 lb.

Automatic Process Timer

A fully automatic multi-duty synchronous process timer is now being made by the ELECTRICAL REMOTE CONTROL CO., LTD., East Industrial Estate, Harlow New Town, Essex. It can be supplied for the maximum time setting of practically any period between 15 sec and 30 days. The operation of this "ElRemCo" timer can be initiated by closing the control circuit by an external push-button, relay, limit switch, etc. When the operation is completed re-setting takes place automatically. The switching capacity of standard contacts is 1 A at 230 V a.c. but contacts with a switching capacity of up to 5 A can be provided. Standard units are arranged to operate from 230 V or 440 V 50 c/s mains.

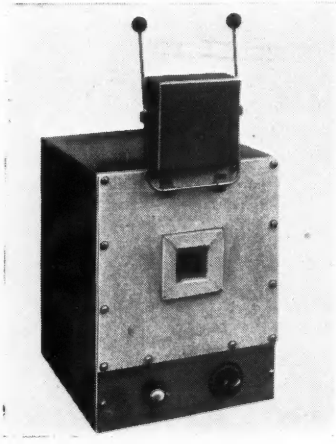


"ElRemCo" synchronous process timer

Muffle Furnaces

The "M" range of electrically operated muffle furnaces for laboratory work and the heat-treatment of metal and small parts which is being made by GRADEC, LTD., 96, Hackney Road, London, E.2, may be supplied for use up to 1,000 deg C or 1,200 deg C with various sizes of models. All furnaces are fitted with balanced rising doors while the standard control equipment consists of a heavy contactor, energy regulator, indicating lights and fuses. Standard models are available for operation on 190 V to 250 V mains.

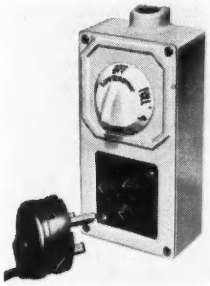
Gradec 1,000/1,200 deg C muffle furnace



Variable Heat Socket

A switched socket now being produced by J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham, 11, incorporates a Sunvic Controls "Simmerstat" and so makes available an economical means of heat control, particularly for portable appliances.

The device, which has numerous domestic and industrial applications, is available in two ranges, one suitable for use with any 15 A 3-pin plug (B.S.546), while the other is designed for use with 13 A rectangular-pin plugs (B.S. 1363). Both surface and flush models are available in each range. The surface model can be supplied either in a cast iron case, finished in cream enamel, or in a black enamel cast iron box with aluminium alloy plate. The flush type has an overlapping plate made either of aluminium alloy or moulded brown "Bakelite."

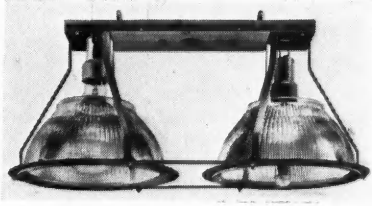


Tucker/"Simmerstat" 13 A switched socket

Mercury-Tungsten Fitting

A range of twin blended lighting units employing both mercury discharge and tungsten filament lamps has been designed by HOLOPHANE, LTD., Elverton Street, London, S.W.1, for industrial installations where high standards of illumination, good colour quality and economy in operation are desirable. By embodying the mercury and filament light sources in the one unit not only has a colour quality approaching daylight been obtained but disconcerting two-colour shadows have been largely eliminated.

Holophane mercury-tungsten industrial lighting fitting



ELECTRICITY IN THE AREAS

Rate Contribution Formula: Line Erection Economy

SOUTH WESTERN

INSTEAD of the local rates formerly paid by electricity undertakings, Area Boards contribute to a global sum as required by the Local Government Act, 1948. In 1951–52 a new formula which gives greater weight to the value of capital assets was used by the British Electricity Authority to determine the individual contributions. This method, in the opinion of the South Western Electricity Board, bears heavily on rural areas where the ratio of capital to revenue is high. Its own payment last year rose by £41,733 to £229,441 and an increasingly adverse effect is foreshadowed. The Authority having exercised its statutory powers to require payment on the new basis, the Board complied under protest. Correspondence on the subject is published as an appendix to the Board's report.

Last year, despite capital restrictions and shortages of materials, the Board provided supplies to 1,174 additional farms (making 10,271 served against 6,330 at vesting date). This record progress represented a major engineering development, but the main problem, says the report, was to find sufficient revenue to make these rural extensions remunerative. The Board's system of line rentals has been a great help in making it possible to finance extensions which would otherwise have been uneconomic; during the year nearly 5,000 agreements of this kind were concluded. Taken as a whole the line rentals paid continued to average 7s 6d a week for farms, 9d for farm cottages and less than 2s for other rural premises. Maintenance of these terms, it is emphasized, depends on the fullest use of electricity, and it is gratifying to note that in the past four years farm electricity consumption has steadily improved, last year averaging 3,768 kWh.

Altogether, new supplies were afforded to 25,673 premises. In negotiations with local authorities the Board has followed the principle that tenants should be free to choose the type of appliances they wish to use. By arranging for adequate wiring installations an increasing number of housing authorities are making this possible and at the same time gaining the advantage of better terms of supply.

New standard tariffs introduced during the year will, it is claimed, spread the higher cost of electricity equitably over the whole range of consumers.

EASTERN

Much of the capital expenditure of the Eastern Electricity Board in 1951–52 was devoted to reinforcement schemes urgently needed to avoid the risk of "widespread and prolonged failures of supply," of which a warning had been given in the Board's previous report. Expenditure on work of this kind totalled £2,506,000, nearly a million pounds more than in 1950–51.

At the same time, the Board was faced with the necessity of limiting its aggregate capital investment to just under 82 per cent of the minimum figure considered necessary, with the result that the rural programme, which it had been hoped to accelerate, was greatly slowed down. The number of villages and hamlets connected was 88 against 181 in 1950–51, and the number of additional farms served, 835 (1,149).

The fact that the cost of materials rose throughout the year further limited the work which could be carried out. Several ways of securing economy were explored, including the development of a pole hole boring machine in which the Board participated. A prototype was delivered and the report records that initial experiments have been successful. Trench digging machinery and other mechanical aids were made use of to reduce costs. Following investigations in the previous year, aluminium overhead conductors were used in place of copper conductors for a number of rural extensions, but the Board says that there are technical reasons which limit this substitution, apart from which supplies of aluminium have tended to become more difficult to obtain.

The Board's Area is exceptional in that in it no fewer than six new towns are being

developed. During the year supplies were provided to 26,213 houses, including 2,058 in new towns. To assist new and old consumers in the efficient use of appliances nearly 5,000 demonstrations were held in Service Centres and elsewhere, and many consumers replaced their domestic appliances with more modern equipment. The Board's staff were also active at agricultural shows and at markets in country districts explaining the value of electricity as an aid to food production.

Under the heading of organization and administration the report shows that economies were achieved by the mechanization of office equipment, merging of districts, etc., but full efficiency is not possible where, as at present, closely associated sections of the staff have to work in widely separated places, some in temporary wooden huts. On the subject of staff, the report says that training under the craft and student apprenticeship scheme was developed during the year and at the end of March there were 60 student and 1,023 craft apprentices in the Board's employment (including those on National Service).

Details are given of the new standard tariffs which have been introduced. Of special note is the inclusion of off-peak rates for domestic as well as commercial and industrial consumers.

MIDLANDS

The substantial savings obtainable through forward purchasing are exemplified in the report of the Midlands Electricity Board, which mentions that 9,000 wooden poles were bought at 65 per cent less than the prices ruling a year later. Among other equipment for which bulk orders have been placed are standard distribution transformers. Dealing further with purchasing, the report says that the high price of water heaters, including purchase tax, has led to the development of a cheaper but effective article. The design of a standard cooker is being studied.

Because of the shortage of copper and lead, attention has been paid to the use of aluminium for overhead conductors and cable sheathing, and sufficient orders have been placed to maintain supplies. To economize in distribution development, the fleet of pole hole borers has been increased, while on suitable estates extended use has been made of overhead construction and under-eaves wiring. Labour has been saved by carrying out surveys for siting overhead lines by aeroplane. A difficult span of the Malvern Hills 66 kV line was erected by helicopter (*Electrical Review*, 18th January, 1952). As part of the expansion of service to consumers, v.h.f. radio communication is being provided in each Sub-Area and sites for transmitting stations have been obtained.

A new grid substation was commissioned during the year at Cheltenham and others are under construction or planned. Distribution reinforcement works put in hand included schemes for additional 66 and 33 kV systems in various districts.

Street lighting by electricity was extended in a number of towns, a further 6,867 points being connected (making 68,307).

In conclusion the report refers to the trend of sales. One of the principal reasons for the recent decline appears to have been a reduction in the demand from industrial users.

EAST MIDLANDS

The financial position of the East Midlands Electricity Board deteriorated to the extent of over a million pounds in 1951–52, when there was a deficit of £825,783 compared with a £222,081 surplus in the previous year. Higher charges, including an increase in the domestic tariff secondary rate from ¾d to ⅞d, came into force at the end of the financial year and are therefore not reflected in the accounts. Tariffs are to be reviewed again this autumn in the light of increased costs and also of the recent decline in sales.

In providing supplies to new housing estates the Board has sought to ensure that the tenants shall be free to make the fullest use of electricity if they choose to do so. Cookers and wash-boilers are offered on simple hire terms as the Board feels that this scheme fulfils a need, especially among consumers who are renting their houses. Economy has been achieved by the erection of outdoor type substations where circumstances permit and the size of cable employed has been kept to the minimum capable of dealing with the estimated future load.

Rural development, in accordance with Government policy, had to be restricted to commitments already made. An additional

1,150 farms were connected, making 4,148 since vesting date, and under one of the major development schemes in Lincolnshire, begun more than a year ago, 17 of the 25 villages included had been afforded supplies by March 31st last.

Connection of large industrial supplies was maintained at a satisfactory rate; 69 special agreements were completed which involved a total potential load of 26,000 kVA, including 10,000 kVA at six collieries. The Board commenced the transfer of the distribution network at Ollerton, Notts, from the National Coal Board and arrangements were also made to take over 410 consumers at Glapwell and Speedwell, Derbyshire.

Agreements were made with 64 lighting authorities who had adopted electricity for street lighting for the first time, and public lighting in every borough and urban district in the Area is now wholly or partially electric. The total number of electric street lighting points at the end of March was 74,631, an increase of 10,849 during the year.

Considerable progress was made with system reinforcement and the provision of additional bulk supply points. A programme was prepared for the progressive replacement of obsolescent switchgear.

The Most Versatile Service

Presidential Address to A.S.E.E.

IN his presidential address to the Association of Supervising Electrical Engineers last Tuesday Mr. C. T. Melling, M.Sc.Tech., M.I.E.E., M.I.Mech.E., M.Inst.F. (chairman, Eastern Electricity Board) discussed the place of electricity in the nation's welfare, which he based on three axioms.

First came the need for increased exports, which entailed the provision of more horse power per worker and the optimum application of electricity to productive purposes. Secondly, more materials, now imported, should be manufactured in this country, e.g. by the electro-chemical industries, and more foodstuffs produced by the electrification of farms and of farm workers' cottages to avoid the drift to towns. A third principle was the encouragement of those industries which gave the highest export yield in terms of imported material, such as electronics.

A prerequisite of the foregoing was the development of the necessary skills through technological training, research into pure and applied physics, and experience in design, manufacture, operation and maintenance of new apparatus. The establishment of new television stations furnished a good example of the provision of such experience. The building of a healthy home market was the surest foundation for an expanding export industry, since it demonstrated a reliability that had been already proved in practice. Other examples were the decision to construct the 275 kV grid, the installation of two gas turbine sets in B.E.A. power stations and the production of domestic appliances.

These last had great export possibilities, since many countries, starting later than Great Britain, had by-passed gas and gone straight for electricity; as an example of this potentiality, exports of electric washing machines were nearly eight times as much as in 1948. Government encouragement in this field implied equality of treatment with competitors of electricity in regard to availability of manpower, materials and capital resources and to purchase tax, advertising and salesmanship in the home market. This was in addition to the need for the B.E.A. to carry out its full generating plant programme.

Fuel Efficiency

Discussing efforts to promote fuel efficiency with especial reference to the recent Ridley Report, Mr. Melling compared the tenfold increase in efficiency of generation since the beginning of the century with the relatively almost static position of other coal consuming industries. Most improvement was obtained when the use of fuel was controlled by skilled operators. Domestic solid-fuel-consuming

appliances, however, did not receive the same expert treatment in design as did boilers and turbines and did not receive the same expert attention and maintenance in use, so that their efficiency soon fell below the optimum. New designs of solid-fuel grates had been produced in small quantities at an efficiency of 40 per cent or even more in the laboratory or in small-scale tests, but some power stations in the U.S.A. had already operated over long periods at 36 to 38 per cent and over 40 per cent was envisaged with improved steam cycles.

Probably the greatest efficiency in domestic use would be achieved where, as with electricity, the heat source was divisible and capable of automatic operation and not by appliances performing several functions, which would not necessarily be in use simultaneously. The electricity supply industry had differentiated between prices for peak and off-peak loads since, in 1892, Hopkinson enunciated the principle of the two-part tariff and did not charge less than marginal cost. Price discrimination, however, could be made to cover only groups of consumers and not detailed variations within groups. More severe peak load problems occurred in some other instances than electricity supply, in which they were much less acute now than 25 years ago. Since then the load factor of supply had increased from 30 to 50 per cent; this compared with 20 per cent for machine tools. Nevertheless there was scope for further improvements, as in tariffs, non-firm supplies, design of off-peak appliances, removal of purchase tax from appliances which raised load factor, and improvement by general industry of the load factor of usage.

E.I.B.A. National Golf Championship

THE Electrical Industries National Golf Championship for 1952 was held at the Worthing Golf Club on 13th and 14th October. Appalling weather conditions delayed the start of the national final on the Monday, and as a result the foursomes competition had to be postponed until the next day.

The winner of the Sir Montague Hughman championship trophy was Mr. J. Fryer (Wilson and Ford, Nottingham). The runner-up, who received the J. L. Wilson cup, was Mr. A. G. Gray (Messrs. G. F. Gray, Northampton). The J. Y. Fletcher cup for the best scratch score was won by Mr. L. G. Chittenden (Wall & Attwood Ltd., Portsmouth), and the Veterans' Trophy, donated by the *Electrician*, was won by Mr. F. J. Oliver (British Thomson-Houston Co., Ltd., Southampton).

A dinner was held on Monday evening at the Assembly Hall, Worthing, Sir Henry Self, the chairman of the National Committee, presiding. The assembly stood in silent respect to the memory of Mr. J. N. Robertson, chairman of the East Midlands Area Golf Championship Committee, who died on 11th October. A toast to the Electrical Industries National Golf Championship was proposed by Mr. H. Drake, president of E.I.B.A. Following this toast, Mr. E. D. Young, chairman of the London and Home Counties Area Committee, presented to Sir Henry Self a cheque for £1,517. This is a record for any Area. A toast to the guests was proposed by Sir Montague Hughman, and replied to by Mr. N. Elliott, chairman, South Eastern Electricity Board and Mr. J. C. Murray, captain of Worthing Golf Club.

On Tuesday, in much better weather, the foursomes trophies donated by Sir Felix Pole were won by Mr. W. M. Todd (English Electric Co., Ltd., Cardiff) and Mr. C. W. Davies (South Wales Electricity Board). The runners up were Mr. W. Plumb (English Electric Co., Ltd., Leeds) and Mr. W. Hyland (South Wales Electricity Board). The competition for the visitors' trophy, donated by the Electrical Wholesalers' Federation, which this year had a record entry, was won by Mr. J. L. Reynolds (Monsanto Chemicals Ltd., Newport, Mon.) and the runner up was Mr. E. J. Cripps (Wallace Electrical Co., London). The best scratch score was put in by Mr. A. Griffiths (South Wales Electricity Board) and the putting competition was won by Mr. A. E. Hayward (Wessex Wholesale Electric Co., Bath).

At the close of the meeting, Sir Henry Self proposed a vote of thanks to the captain and secretary of the committee of the Worthing Golf Club, and the whole assembly also expressed their gratitude to Mr. W. J. Bird, hon. national secretary, and his colleagues, Miss E. Woodley, Mr. Frank Farthing and Mr. C. F. Boyes, who had been responsible for all the arrangements of the golf competition and the dinner. Through the efforts of the National Golf Championship Committee the E.I.B.A. finances should benefit this year to the extent of £2,500.

Commerce and Industry

Power Engineers' Claim Deferred

Australian Import Tariffs

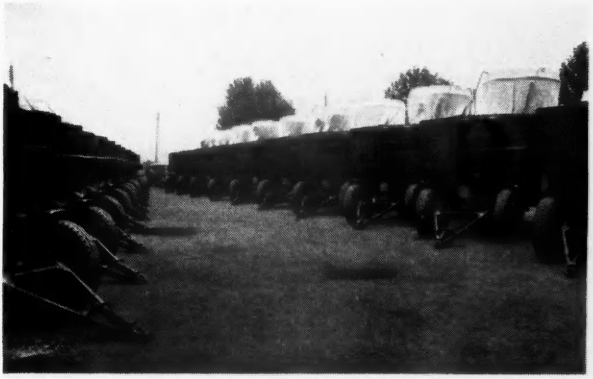
WE reported on 22nd August that the Electrical Power Engineers' Association had agreed to defer its claim for a 10 per cent increase on behalf of its electricity supply industry members. Mr. Harry Norton told the National Joint Board that the Association had no desire to aggravate the spiral of rising costs and higher salaries but that if it were found that other people's claims were being granted it would be impossible for the technical engineering staff to lag behind. The matter was raised again at the September meeting of the N.J.B. and again the Association agreed to defer further action until the Board's November meeting.

E.T.U. Claim Rejected

Electron, the journal of the Electrical Trades Union, reports that the National Federated Electrical Association has rejected the Union's claim for an immediate wage increase for members employed in the electrical contracting industry. The Federation considers that no case for an increase has been established and that wages in the electrical contracting industry cannot be dissociated from other matters under investigation by a special sub-committee of the industry's National Joint Industrial Council.

Electronic Equipment for U.S. Army

Mobile fire-control radar, type A.A. No. 3 Mk 7, recently ordered from the British Thomson-Houston Co., Ltd., by the U.S. Army European Headquarters Command is now being despatched. The accompanying picture shows part of the fleet of military vehicles in which this radar equipment has been fitted. With each equipment there is a 17·7 kVA mobile diesel-alternator set. These radar sets form part of the $4,200,000 order announced a short time ago.



Part of a consignment of B.T.H. radar equipment for the U.S. Army

City and Guilds Exhibition

The Duke of Edinburgh will inspect an exhibition at Goldsmiths' Hall on 3rd November showing the work of the City and Guilds of London Institute, of which he is President. The exhibition, entitled "Training for Industry," has been arranged in connection with the Institute's yearly meeting, over which the Duke will preside. The exhibition will be open to the public from 4th to 14th November. Features of the exhibition will be models of scientific and engineering equipment, including a supersonic wind tunnel from the City and Guilds College, South Kensington, students' work in fine arts and crafts from the City and Guilds Art School, Kennington, and a pictorial presentation of the work of the Institute's Department of Technology.

Commercial Travellers' Schools

We have received a letter from Mr. C. Gordon Maynard, president of appeal for 1952 of the Royal Commercial Travellers' Schools. Mr. Maynard briefly outlines the work of the schools, saying that at present 265 children are being maintained, including 15 from the electrical trade (the latter cost about £3,300 yearly). Upkeep expenses have naturally risen considerably in the last few years and vital rebuilding

work has had to be carried out, seriously depleting the capital funds. Mr. Maynard expresses his gratitude to friends of the Schools who have given generously in the past and appeals to the electrical industry to help him to raise a substantial sum for this good cause during his year as appeal president.

Hoover Commonwealth Scholarships

The directors of Hoover, Ltd., have decided to offer a number of graduate apprenticeships, for the study of production engineering, to graduates of Commonwealth universities, starting with one student from Australia and one from South Africa, as from the beginning of next year. The scholarships will cover a return passage from the candidates' countries to England and are valued at about £1,000 each. Courses will normally cover a period of one year but may be extended to two years. The scholarships are open to young men who are Commonwealth nationals, over 21 years of age, graduates of recognized Commonwealth or British universities, and have taken mechanical and electrical engineering as their principal subject and now wish to specialize in production engineering.

Work Study Training

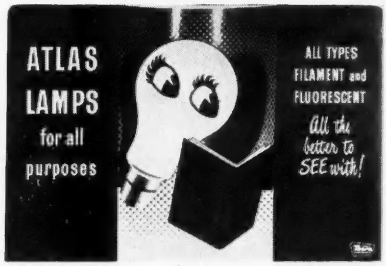
As a culmination of the development of the teaching of work study (motion study, time study, job evaluation and incentives) over the past five years in the Department of Industrial Administration of the College of Technology, Birmingham, the Department has announced a series of full-time courses in the practice of work study. The full-time courses will each be of six weeks' duration and will be restricted to ten students training for, or holding, responsibility for work study in manufacturing industry.

Driver-Harris Conference

An international gathering of associates and distributors of the Driver-Harris companies was held at Alderley Edge, Cheshire, from 7th to 10th October, when the improved Driver-Harris alloys and their expanded fields of application in many countries of the world were surveyed. A major part of the conference was devoted to discussion of papers on the new nickel-chrome alloy "Karma," "Nichrome" and "Nichrome V" developments, nickel-iron alloys, spark plug alloys, nickel-alloys for electronic and electrical uses, material for water meters, and thermo-couple materials. The conference was welcomed by Mr. R. M. Parry, managing director of British Driver-Harris Co., Ltd.

Lamp Publicity

Display material prepared by Thorn Electrical Industries, Ltd., for its autumn lamp campaign includes a centre-piece in royal blue and purple, which can also be used on the counter or shelf.



A Thorn "Atlas" lamp centre-piece for window or counter display

Another counter display, with the same combination of colour, has an actual lamp affixed to it by a rubber sucker, creating the illusion that the lamp is suspended without visible means of support. An attractive 16-sheet poster is now appearing on hoardings in the provinces, and double crown prints are also available for dealers' use.

Newcastle Exhibition of Plastics

An exhibition of plastics, organized by Bakelite, Ltd., was held in the Royal Turks Head Hotel, Newcastle-on-Tyne, from 21st to 24th October. The exhibition was designed to demonstrate to manufacturers and others in widely separated areas what can be done with the materials which are available to-day.

Equipment for the Near East

Crypton Equipment, Ltd., has just received from the Near East an export order to the value of approximately £20,000. This order is for standard items of Crypton automobile service equipment and covers fast battery chargers, electrical test benches, distributor analysers, portable engine test equipment and electrical service tools.

Industrial Productivity Conference

In announcing last week the forthcoming Industrial Productivity Conference organized by the British Electrical Development Association we inadvertently gave the dates as 28th and 29th October. Actually the conference is being held on the 29th and 30th; the luncheon will be held on the first day.

"Diesel Digestion"

The above title was chosen by Mr. G. B. Fox (senior principal officer, Royal Naval Scientific Service) for his presidential address to the Diesel Engine Users' Association in London on 16th October. He discussed, with references to experimental work in the subject, some of the factors (which are independent of the means employed for mixing the fuel oil with air) that

collectively enable digestion of fuel oil to take place within the engine cylinders.

Australian Tariff Inquiries

The Australian Commonwealth Minister of Trade and Customs has referred to the Tariff Board for inquiry and report the question of the rate of duty to be imposed on circuit breakers or switch units, metalclad or otherwise, for above 15 kV or at any voltage if the rated rupturing capacity is 250 MVA or more. The present rates are free under the British preferential tariff, and 12½ per cent under the most favoured nation tariff and general tariff. Consideration is also to be given to the rates of duty on Tariff item 179B (7), switches, n.e.i.; fuses, n.e.i.; lightning arrestors, n.e.i.; cutouts, n.e.i.; choke coils, n.e.i.; relays, n.e.i. The existing duties are 22½ per cent British preferential tariff; 45 per cent m.f.n. tariff; and 50 per cent general tariff.

Notification from United Kingdom interests who wish to give evidence must be received by 5th November. Trade associations and firms should therefore communicate immediately with the Board of Trade, Commercial Relations and Export Department, Horse Guards Avenue, London, S.W.1 (Ref. C.R.E. 34451/52).

Tomato Growing in Lancashire

Some of the biggest growers of tomatoes in the Fylde district of Lancashire are preparing to put in special electrical installations as a result of the successful trials in parts of North Lancashire and the Lake District, which have shown that tomatoes can be produced and sent to market weeks ahead of the normal time by the use of electric soil-warming equipment, warmed benches to produce the seedlings, and light irradiation to reproduce daylight conditions throughout the winter.

Mobile Substation

The Parolle Electrical Plant Co., Ltd., has designed a complete electrical substation on wheels for use in the oil fields of Venezuela. The substation equipment weighs 28 tons and is mounted on a 14-ton trailer which can be towed to the scene of operations. It is 38ft long, 10ft wide and 16ft high. A. Reyrolle & Co., Ltd., made the h.v. and l.v. circuit breakers for the substation, and C. A. Parsons & Co., Ltd., made the power transformers. The substation has been ordered by the Shell Petroleum Co., Ltd.

Old N'Ions

The Old N'Ions Association will be holding its silver jubilee annual dinner and reunion on 28th November at the Connaught Rooms, W.C.2, at which the guest of honour will be Lord Eustace Percy, a former Minister of Education and Rector of the University of Durham. Membership of the Association comprises past students of the Northampton Engineering College, Clerkenwell, and any past student can obtain a ticket from the entertainments secretary, Mr. R. W. C. Gilbert, 6, Ella Road, London, N.8.

Virgin Aluminium Price Increase

The Ministry of Materials has announced that from 20th October the price of virgin aluminium in ingot form has been increased from £157 to £166 per long ton delivered into consumers' works, for metal of a purity of 99 per cent to 99·5 per cent inclusive. There will be no change in the premiums which came into effect on 1st July for metal of higher purity and for metal in notch bar form. The Ministry expects to be able to keep the price at this level at least until April, 1953.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £166 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8½d
Sheet	ton £339 0s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £86 5s 0d
Foreign	ton £85 0s 0d
MERCURY	flask £65 0s 0d
TIN	ton £953 0s 0d
ZINC, G.O.B. Foreign ..	ton £118 0s 0d
Electrolytic	ton £122 0s 0d
BRASS Tubes	lb 2s 3d
Sheet	lb 2s 5½d
Wire	lb 2s 8¼d
PHOSPHOR BRONZE	
Wire	lb 4s 1½d
RUBBER, No. 1 R.S.S. spot ..	lb 21½–21¾d

Large Salt Evaporator

In our article on the new factory of Murgatroyd's Salt & Chemical Co. (*Electrical Review*, 29th August) reference was made to the triple-effect evaporator installed for the main salt production. We should have mentioned that this was designed and made by the Mirrlees Watson Co., Ltd.

Bathroom Fatality

Recording a verdict of "Accidental death" at an inquest at Woking recently the coroner said he thought it was full time that the public realized the danger of extraneous electrical apparatus in bathrooms. The inquest was on a fourteen-year-old girl who was killed when she touched an electrically heated towel rail while she was standing in the bath. An installation inspector of the South Eastern Electricity Board stated that the towel rail was connected to the supply through a three-core lead to a multi-way adaptor at the lamp socket. Two wires in the lead were properly connected; the

third, the earth, was just tucked into the adaptor and at any time might have been in contact with the live terminal, as it was when inspected. The girl's father said he had fitted the towel rail about five years ago and had never had any trouble with it.

Visit to America

At a meeting of the Electrical Association for Women's National Executive Committee and the London Branch at its headquarters on 15th October, Dame Caroline Haslett spoke of her recent visit to America and Canada in her capacity as president of the International Federation of Business and Professional Women.

In comparing American and British domestic electrical apparatus, Dame Caroline said that although American appliances were fitted with many more gadgets, British equipment worked just as well. American refrigerators were very glamorous looking and some had gilt fittings, also many homes were fitted with electrical sink units including garbage disposal. Home freezing was very popular. Dame Caroline found Canada more go-ahead than America in electrical interest. At present the Aluminum Company of Canada was building a new all-electric town at Kitimat.

During her visit, Dame Caroline found time to broadcast over several radio networks and to appear on television.

Change of Address

The public relations section of the British Electricity Authority has moved from 170, Great Portland Street, W.1, to the administration headquarters of the Authority at Winsley Street, W.1 (Waring and Gillow building, near Oxford Circus); telephone: Museum 4040.

Trade Announcements

Correspondence and inquiries addressed to the London office of **Santon, Ltd.**, are, we are informed, still being sent to the old address in Vincent Square. The London office and stores of the company are now at East Acton Arcade, Old Oak Common Lane, Acton, W.3 (telephone : Shepherds Bush 3311). The London manager of the company is Mr. A. J. Wyndham Roberts.

The International Refrigerator Co., Ltd., has established its sales and service organization for the north western district at 93, Corporation Street, Manchester (telephone : 8441/2/3 and 0377/8).

The **David Brown Companies** have recently acquired the first floor suite of 96, Piccadilly, London, W.1, as their new London headquarters. As from Monday next the present London office sales staff will be transferred from Bush House, London, W.C.2, to the above address (telephone : Grosvenor 7747). For the time being the London office of David Brown Tractors, Ltd., will remain at 49-50, Avenue Chambers, Vernon Place, Southampton Row, London, W.C.1, but this will be transferred about the end of the year.

A. C. Morrison (Engineers), Ltd., announce that their offices and sales organization has now been removed to their factory at Cliff Works, Burton-on-the-Wolds, Nr. Loughborough, Leics (telephone : Wymeswold 295/6).

A. B. Metal Products has completed negotiations with the Clarostat Manufacturing Co., Inc., of New Hampshire, U.S.A. for the sole manufacturing and distribution rights for the British Empire of the Clarostat range of products which includes wire wound and carbon potentiometers and resistors.

Ekco-Ensign Electric, Ltd., has appointed Mr. F. A. Thiel as its Northern sales manager with headquarters in Manchester and Preston. Mr. J. R. Wilson has been appointed as the company's representative for Devon, Cornwall and certain areas of West Somerset.

The service office, workshops and stores of the Manchester Branch of **Prestcold Refrigeration** are now at 112/120, Cottenham Street, Chorlton-on-Medlock, Manchester, 13 (telephone : Ardwick 4801).

Catalogues and Lists

The Quasi-Arc Co., Ltd., Bilston, Staffs.—Instruction booklet for the installation and operation of the "Quasi-Arc" portable arc welding set type ACP.300 and technical circular describing the company's "Low Hydrogen 35" electrodes (TC.858).

S. Lesser & Sons (1928), Ltd., 69, Mile End Road, London, E.1.—Illustrated catalogue showing a few selected items including electric domestic appliances.

The Morgan Crucible Co., Ltd., Battersea Church Road, London, S.E.11.—Technical folder describing the "Morganite" positive drive unit seal (SD.45).

Air Control Installations, Ltd., Ruislip, Middlesex.—Publication B.522 relating to the "Cycoil" oil bath air cleaner.

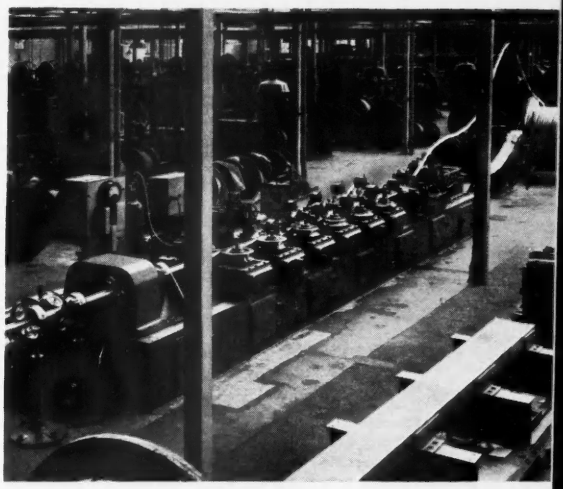
Bylock Electric, Ltd., 109, South Street, Ponders End, Middlesex.—Illustrated literature relating to the new "Centurion" vacuum cleaner, the "Victor" safety iron, hair dryers and spray units, together with price lists.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—Illustrated priced leaflet announcing price reductions of "Mazda" fluorescent fittings.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Illustrated folder, together with revised prices leaflet, on fluorescent fittings, control gear and accessories (F.1872).

Aluminium Sheathed Cable

Corrugated Type Produced by Pirelli-General

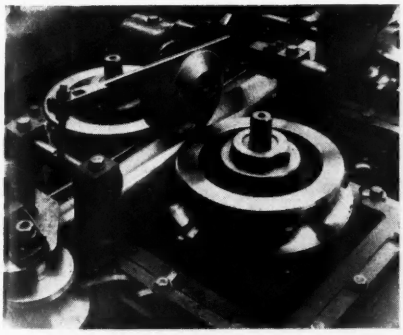


The aluminium sheathing machine showing the six sets of forming rolls closing the strip around the cable core

THERE are several methods of producing aluminium sheathed cables: the one chosen by Pirelli-General Cable Works, Ltd., consists alternatively in the rolling down or corrugating of a welded aluminium sheath. The first step in the process, which has been developed in conjunction with the G.E.C. research laboratories, is making aluminium tube from strip.

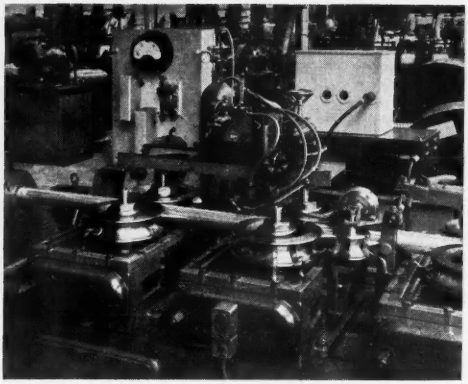
After cutting and cleaning the strip is passed through six sets of forming rolls which close it round a cable core, the last stage also acting as the seam closure roll for welding. The formed and closed strip then passes under an Argon arc welding torch which is mounted vertically upon the closed sheath seam and is provided with facilities for regulating the arc in relation to the seam. The G.E.C. twin-arc process is used, fed from a 3/2 phase Scott connected transformer drawing balanced current from the mains. An h.f. spark discharge unit is included which serves to start the a.c. for welding without the tungsten electrodes coming into contact with the work. To avoid contact between the cable core and the bead of molten metal under the weld, a shaped metal shoe is interposed as a backing strip between the sheath and the core. This may be water cooled or alternatively used to supply insert gas to the under-side of the weld.

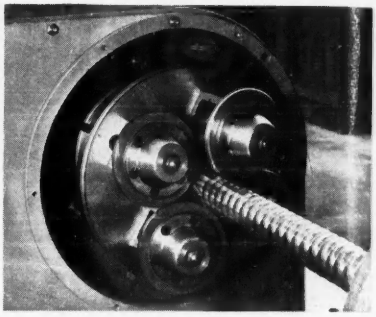
A close view of the tube forming rolls



The cable sheath is then reduced in diameter either by rolling down or corrugating. Rolling down is done by passing the formed and welded tube through a planetary roll system incorporating four curved tapered rolls of deep section driven at fairly high speed. This reduces the sheath diameter without alteration of form or appreciable increase in length, the surplus metal being absorbed in uniform thickening of the wall. In this way, a useful range of cable diameters may be covered by a single size of tube.

In corrugation, the effective internal





Left: **The welding head uses the G.E.C. twin-arc process to close the sheath seam.** *Right:* **A radiused indenting roll and three thrusting rolls form corrugations in the sheath**

diameter of the over-size sheath is reduced by substituting for the set of four tapered rolls a radiused indenting roll and three thrust-opposing rolls driven at a predetermined speed in accordance with the type of corrugation required. The resultant cable is claimed to be remarkably flexible in that it requires little effort to bend it and that it withstands repeated bending at diameters appropriate to lead sheathed cable without undue damage or distortion.

Although aluminium strip is available commercially, in continuous lengths adequate for most types of underground cable, a technique of cross-jointing strip by welding has been developed which has a strength after peening almost equal to that of the parent metal.

The corrugated cable will withstand the bench test called for in B.S.480/1942 without mechanical damage to the sheath. When this test is applied to a cable with a plain cylindrical aluminium sheath, however, it may produce such sheath distortion as might seriously injure the dielectric. Thus it has been agreed tentatively to increase the bend test diameter to 20 d when testing such cables and under these conditions the sheath which is made by welding and rolling down behaves satisfactorily. Weld strength has also been investigated and it has been found that the weld edges are only slightly weaker than the remainder of the sheath wall. Hydraulic tests have been carried out and preliminary results show that the corrugated sheath has adequate strength to function satisfactorily in any of the accepted types of oil-filled or gas-pressure cable without external metallic reinforcement.

Electrical Manufacture in Canada

THE gross factory value of products manufactured in Canada by establishments comprising the electrical apparatus and supplies industry reached a record figure of $676,009,000 in 1951, an increase of slightly more than 16 per cent over the previous highest—$580,578,000 for 1950—according to advance figures released by the Dominion Bureau of Statistics. The net value—gross, less cost of materials, fuel and electricity—rose from $315,136,000 in 1950 to $353,603,000 in 1951. There was a rise in the number of employees from 60,300 to 67,600, while salaries and wages rose from $155,334,000 to $194,749,000. Cost of materials for use in manufacturing processes advanced from $260,306,000 to $316,561,000. The number of plants in Canada decreased from 382 to 373.

The gross production values for four of the five main sub-groups into which the industry is divided were substantially higher in 1951 than in the preceding year. The heavy electrical machinery and equipment section had the highest total at $221,569,000 (compared with $187,758,000 in 1950), while refrigerators, vacuum cleaners and appliances were valued at $110,013,000 ($120,930,000), radios and radio parts at $85,624,000 ($66,597,000), batteries at $37,721,000 ($34,558,000), and miscellaneous electrical products at a value of $221,082,000 ($170,735,000).

ELECTRICITY SUPPLY

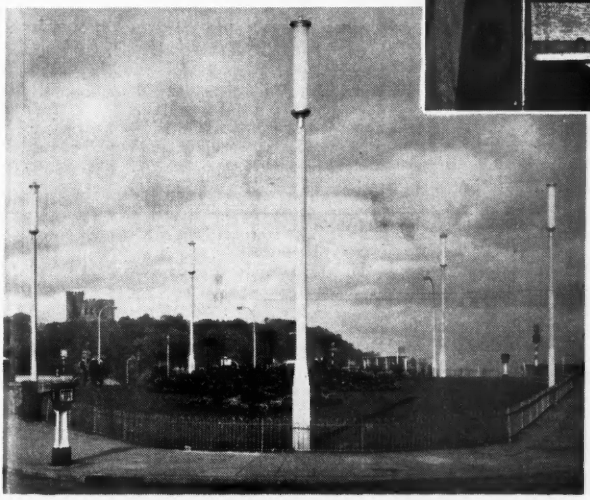
Cowal Scheme Extension

Dudley's New Street Lighting

THE North of Scotland Hydro-Electric Board published last week details of an extension to its Cowal hydro-electric scheme to meet the rapid increase in demand for electricity in the surrounding district. The scheme (Constructional Scheme No. 69) consists of a series of aqueducts and short tunnels which will collect, at a level of about 500ft above sea level, the headwaters of a number of small streams at present flowing into the head of Loch Riddon. The water will be diverted through the hill between Loch Riddon and Loch Striven to an aqueduct and thence through a pipe to the existing power station on the shores of Loch Striven. Where the pipe crosses the flat marsh land at the head of Loch Striven, it will be buried. The Cowal hydro-electric scheme was officially opened in September, 1951. It has an estimated annual output of 14 million kWh; the extension now proposed will increase this by 4·6 million kWh.

Unusual Street Lighting

A new fluorescent lighting installation just completed in the Market Place and High Street, Dudley, is stated to be the first in the country to employ vertical cylindrical lanterns mounted on artificial stone columns. Altogether there are thirty-eight of these lanterns which are designed not only to provide adequate lighting for the safety of road users, but also to give effective illumination for the adjacent buildings, thus imitating natural daylight as far as practicable. For the other main roads 212 "Silverblue" mercury lanterns have been installed, the primary consideration being road safety by night, though at the same time particular attention has been paid to the daylight appearance of the lanterns and columns, which have been approved by the Royal Fine



Mr. P. Tonks (Revo Electric Co.) presenting the Mayor of Dudley with a miniature lamp standard at the switching on of the town's new street lighting. The photograph on the left shows the vertical fluorescent and "Silverblue" lanterns around an island site

Art Commission. The whole of the equipment was supplied and erected by the Revo Electric Co., Ltd. The switching-on ceremony was performed on 9th October by the Mayor of Dudley, Alderman J. Silcox, in the presence of members of the Council, Corporation officials, members of the Midlands Electricity Board, and directors and representatives of the Revo Electric Co. To commemorate the occasion Mr. P. Tonks, joint managing director of the company, presented the Mayor with a miniature lamp standard.

Rural Supplies in Wales

Reference to the British Electricity Authority's hydro-electric scheme for North Wales is made in the annual report of the Council for the Preservation of Rural Wales. The report states that "wishful thinkers" who imagined that sanction for a hydro-electric scheme meant early electrification in North Wales would do well to ponder the statement made to the Select Committee by the chairman of the Merseyside and North Wales Electricity Board that it would take "somewhere plus of 25 years" to complete the Board's rural distribution system.

Development in North East

At the quarterly meeting of the North Eastern Electricity Consultative Council it was reported that during the quarter the Board had approved estimates for new work amounting to £728,857. During the quarter 56 new substations had been brought into use and in addition high voltage supplies were afforded to 13 industrial and commercial consumers. Dealing with rural supplies, the Board stated that 57 farms had been connected compared with 80 in the corresponding period of last year and electricity had been extended to another 10 villages.

Birkenhead Change-over Plans

Mr. W. Gilchrist, chief commercial officer to Merseyside and North Wales Electricity Board, told members of Birkenhead Chamber of Commerce recently that the change-over of Birkenhead's electricity supply from d.c. to a.c. would eventually cost more than £1,000,000. Already £200,000 had been spent, but with the present capital restrictions and work on new housing schemes it would be a long time before the change-over was completed.

School Installations

The West Riding County Council Education Committee has approved a scheme estimated to cost £3,600, for renewing the electrical installation at the Grammar School, Goole.

Middlesex County Council Education Committee recommends approval of a scheme costing £592 for improving the lighting at the Featherstone Road Secondary Modern Boys' School, Southall.

Line Diversion

Following negotiations with the South Shields Town Council, the British Electricity Authority has agreed to divert to the eastern boundary of the estate, an overhead line which crosses the Whiteleas housing estate.

HIGHER OUTPUT IN SEPTEMBER

LAST month's increase in electricity generated —compared with a year ago—of 8 per cent was the highest since February. A contributory factor was undoubtedly the colder weather which prevailed, as recorded in the Ministry of Fuel and Power's statement of average weekly temperatures. In each of the four weeks in September the figure was lower than in the corresponding period of 1951, the differences being 2·8, 7·6, 3·8 and 1·9 deg F respectively.

September saw the installation of the first oil-fired boiler (a 375,000 lb hr Foster Wheeler unit)

TABLE I.—ELECTRICITY GENERATED AND PLANT INSTALLED

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water power	Total*		
British Electricity Authority ..	2,670	4·1	4,691	23	4,722	4,439	16,356
North of Scotland	18	1·0	27	68	99	97	643
Total for September, 1952 ..	2,688	5·1	4,718	91	4,821	4,536	16,999
Corresponding total for Sept., 1951	2,556	5·3	4,325	126	4,462	4,203	15,580
Increase or decrease, per cent ..	+5·2	+1·9	+9·1	−27·8	+8·0	+7·9	+9·1
Total for year to date (9 months)..	24,187	49·2	42,989	1,189	44,290	41,721	
Total for corresponding months of 1951	24,892	64·8	42,272	1,029	43,431	40,975	
Increase or decrease, per cent ..	−1·6	−24·1	+1·7	+15·5	+2·0	+1·8	

* The total includes 7·6 million kWh generated by oil engines and 4·2 million kWh by waste heat plants in September, 1952.

TABLE II.—ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for September			Cumulative totals for six months April-September			Totals for 12 months ended 30th September		
	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %
London	353·4	392·4	+11·0	2,169·6	2,117·6	− 2·4	5,294·6	5,247·9	− 0·9
South Eastern	212·4	238·3	+12·2	1,260·5	1,281·5	+ 1·7	2,935·4	3,035·9	+ 3·4
Southern	248·1	290·6	+17·1	1,443·0	1,520·7	+ 5·4	3,322·7	3,527·1	+ 6·2
South Western	123·3	136·4	+10·6	729·5	743·0	+ 1·9	1,677·2	1,701·5	+ 1·4
Eastern	349·0	391·9	+12·3	2,084·8	2,104·8	+ 1·0	4,804·4	4,920·7	+ 2·4
East Midlands*	314·7	343·8	+ 9·2	1,868·2	1,859·8	− 0·4	4,159·9	4,231·0	+ 1·7
Midlands*	125·6	138·2	+10·0	2,513·0	2,531·5	+ 0·7	5,649·2	5,795·0	+ 2·6
South Wales*	253·8	267·9	+ 5·6	1,458·2	1,546·9	+ 6·1	2,989·1	3,227·8	+ 8·0
Merseyside & N. Wales*	267·4	261·8	− 2·1	1,577·4	1,478·8	− 6·3	3,468·9	3,369·7	− 2·9
Yorkshire*	111·0	158·8	+11·6	2,466·6	2,516·2	+ 2·0	5,447·6	5,596·3	+ 2·7
North Eastern*	271·3	280·4	+ 3·4	1,616·3	1,550·7	− 4·1	3,472·7	3,476·7	+ 0·1
North Western*	187·9	182·9	− 1·0	2,887·1	2,711·1	− 6·0	6,266·4	6,306·3	+ 0·6
South-East Scotland	83·8	92·5	+10·4	504·1	517·9	+ 2·7	1,161·7	1,202·8	+ 3·5
South-West Scotland*	205·0	221·6	+ 8·1	1,230·0	1,225·5	− 0·4	2,860·5	2,893·1	+ 1·1
Total all Area Boards	4,006·7	4,327·5	+ 8·0	23,808·3	23,709·0	− 0·4	53,510·3	54,531·8	+ 1·9
Direct Supplies by B.E.A.	55·5	59·7	+ 7·6	341·2	351·9	+ 3·1	702·9	720·0	+ 2·4
Grand Total	4,062·2	4,387·2	+ 8·0	24,149·5	24,060·9	− 0·4	54,213·2	55,251·8	+ 1·9
Mainly Industrial Areas*	2,363·7	2,785·4	+ 5·6	15,616·8	15,423·5	− 1·2	31,314·3	34,895·9	+ 1·7
Mainly Non-Industrial Areas	1,370·0	1,542·1	+12·6	8,191·5	8,288·5	+ 1·2	19,196·0	19,635·9	+ 2·3
Total Number of Working Days	27·1	27·8		165·7	165·7				

* Over half the total sales by the Boards in 1951–52 was to industrial consumers.

at the B.E.A. London Division's Bankside power station. Other boilers were commissioned during the month at Battersea (Babcock & Wilcox 425,000 lb hr), Poole (International Combustion 300,000 lb hr), Nechells "B" (I.C. 230,000 lb hr), Bromborough, Braehead and Westwood (B. & W. 300,000 lb hr units), Huncoat (Simon Carves 305,000 lb hr), Blackburn (Simon Carves 150,000 lb hr) and Clarence Dock (B. & W. 350,000 lb hr). A Metropolitan-Vickers 31·5 MW set was brought into operation at Plymouth "B," a 45 MW set by the same makers at Cliff Quay and a 30 MW B.T.H. set at Westwood. The total installed capacity (B.E.A., North of Scotland Hydro-Electric Board and the Lochaber Power Co.) at the end of September was 16,999 MW (Table I) compared with 16,878 MW a month before, an increase of 121 MW.

Table II shows the sale of electricity by the B.E.A. and the amounts taken by Area Boards for their consumers. The national figures show an increase over September, 1951, of 8 per cent, but, when corrected for the number of working days and weather, the increase is only 2·5 per cent.

The figures are provisional and no account is taken of the supplies received by Area Boards from other sources, which are, however, comparatively small.

Some of the factors influencing the rate of development in the Southern, South Wales, Merseyside and North Wales, North Eastern and North Western Areas continue to apply. Two very large consumers in South Wales and in the North Western Area substantially reduced their consumption in September.

Severn Barrage

MR. Robert Jenkins, M.P., suggested in a letter to *The Times* last week that the Severn Barrage scheme should be proceeded with as a source of supply of electricity for aluminium production, instead of constructing the Volta dam (Gold Coast) to provide power for this purpose.

On Monday a letter appeared from Mr. H. Nimmo, chairman of the Southern Electricity Board, pointing out that power from a Severn Barrage would be intermittent and therefore quite unsuitable for aluminium manufacture. He also said that the scheme would not save one kilowatt of steam plant. While it would save under a million tons of coal a year, Mr. Nimmo mentions that the electrification of our main line railways would save 9¾ million tons annually.

In the same issue of *The Times* Sir Hugh Beaver writes in favour of proceeding with the scheme in view of the fact that hydro-electric power is unlikely to be superseded by atomic power plants or gasified underground coal, for thirty years at any rate.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Cable & Wireless (Holding), Ltd.—In order to place its loan capital on a more permanent footing, the company proposes to issue £3,632,662 5 per cent debenture stock, 1972-77, for conversion or repayment at par on 1st December next of the same amount of the outstanding 3 per cent loan stock. At the same time the 3 per cent and 4 per cent loan stockholders and ordinary stockholders will be given the right to apply for any balance of the issue remaining after satisfying conversion applications. The issue is being underwritten by Lazard Brothers & Co., for a commission of $1\frac{5}{8}$ per cent. Holders of £4 million 4 per cent loan stock, due to be redeemed by 31st December, 1960, will also be given the option to convert up to 50 per cent of their holdings into the new 5 per cent debenture stock, additional amounts of which will be issued to meet conversion applications. This operation is not being underwritten. The maximum amount of new debenture stock to be issued will be £5,632,662 if all holders of the 4 per cent take advantage of their conversion option.

The Kalgoorlie Electric Power & Lighting Corporation, Ltd.—The annual meeting was held on 15th October, Mr. W. F. Talbot (chairman) presiding. In his circulated statement, the chairman said that the increased revenue derived from the increase in the power rates charged to bulk consumers was not sufficient to counter completely the effects of the poor results achieved during the first five months of the year, and there was a net loss for the year of £3,675. Sales of electricity totalled 48.5 million kWh, as compared with 53.7 million during 1950. The drop in output reflected the loss of two mining consumers who ceased operation during the year under review. It was hoped that the new coal-burning boilers would have been in operation by now but the coal situation in Western Australia was so acute that the State Government was at present unable to guarantee continuous supplies of coal sufficient for their needs. It was imperative that the change-over to coal should be effected as soon as possible. One of their largest consumers, having acquired diesel plant, had given notice that from May next they would generate their own power. This loss would affect the extent to which it would be possible to reduce power rates when the new plant was operating.

Parsons Marine Steam Turbine Co., Ltd., reports a net profit for the year to 30th June last of £30,959, as compared with £126,395 for the preceding year. To this is added £40,000 tax provision no longer required and £114,245 brought in, making £185,204 available. It is proposed to pay a final dividend of $9\frac{1}{2}$ per cent, and a special dividend of 5 per cent, making a total of $17\frac{1}{2}$ per cent for the year (against $12\frac{1}{2}$ per cent).

Mr. G. L. Parsons (chairman) says that considerable progress towards the settlement of outstanding taxation liabilities regarding the completion of wartime contracts has been made, and it has been possible to bring into the accounts £40,000 not now required. Out of this the directors propose to pay the special distribution now announced with the final dividend.

Thos. W. Ward, Ltd., report that after deducting £1,076,564 for taxation, the group net profit for the year ended 30th June last is £805,471, as compared with £794,084 for 1950-51. The present company's net profit is £574,955 (against £550,188). Reserves receive £435,000 and it is proposed to pay a final ordinary dividend of 10 per cent, and a bonus of 5 per cent, making 20 per cent for the year (unchanged). The balance carried forward is £497,727 (against £519,953 brought in).

Ferranti, Ltd., in a preliminary statement, reports a net profit for the year to 30th June last, after providing £645,000 for taxation, of £529,208, as compared with £540,129 for 1950-51. The ordinary dividend for the year is unchanged at 6 per cent. At the annual meeting on 20th November a resolution will be submitted increasing the company's borrowing powers from the present limit of £3,000,000 to £5,000,000, including moneys borrowed by subsidiaries.

The Ebonite Container Co., Ltd., reports a group profit for the year ended 31st March last, after deducting £117,000 for taxation, of £77,944, as compared with £97,871 for the preceding year. It is proposed to maintain the dividend for the year at $17\frac{1}{2}$ per cent by a final payment of 13 per cent.

The British Electric Traction Co., Ltd., has declared an interim dividend of 10 per cent on the deferred ordinary and "A" deferred ordinary (against $7\frac{1}{2}$ per cent).

The Ever Ready Trust Co., Ltd., is paying an interim dividend of 5 per cent (same).

The London Electric Wire Co. & Smiths, Ltd., has declared an interim ordinary dividend of 5 per cent (against 4 per cent). The directors state that the increase does not imply a higher distribution for the year.

Murex, Ltd., has applied to the Capital Issues Committee for permission to issue 200,000 ordinary £1 shares to be offered as rights to ordinary stockholders.

Babcock & Wilcox, Ltd., have declared an interim ordinary dividend of 7½ per cent (unchanged).

Hopkinsons, Ltd., have declared an interim dividend of 10 per cent (against 7½ per cent).

The Calcutta Electric Supply Corporation, Ltd., is paying an interim dividend of 3 per cent, tax free (unchanged).

New Companies

Besson & Robinson, Ltd.—Registered 6th October. Capital £1,000. Electricians, electrical, electronic, telegraphic and telephonic, radio, wireless, television, mechanical, automobile and general engineers, etc. Directors: A. F. Woolsey, A. P. Besson, D. Robinson and D. D. Mathieson. Regd. office: 103, Cannon Street, E.C.4.

Grundig (Great Britain), Ltd.—Registered 29th September. Capital £10,000. Manufacturers of and dealers in very high frequency equipment, sound recording apparatus, radio, wireless, radiograms, television, etc. Directors: P. S. Bacher and A. E. Johnson. Regd. office: 103, Cannon Street, E.C.4.

Metal Fittings, Ltd.—Registered 8th October. Capital £2,000. General and electrical engineers, metal workers, manufacturers of plant, patterns and implements used in electrical undertakings or otherwise, etc. Subscribers: R. B. Sterry and G. Prince. Solicitors: Mount Sterry & Co., 24, Martin Lane, E.C.4.

George Matthews, Ltd.—Registered 7th October. Capital £1,000. Retailers, wholesalers, manufacturers, factors, distributors and dealers in electrical goods and appliances, wireless and television sets, components, etc. Directors: G. E. Matthews and Dorothy M. Matthews. Secretary: Dorothy M. Matthews. Regd. office: 15, Soho Square, W.1.

Fraikad, Ltd.—Registered 14th October. Capital £500. Electrical and mechanical engineers and contractors, etc. Directors: E. Frais, director of Q. F. Lighting Co., Ltd., Paul Kader, director of Frank Thrower (Exports), Ltd., etc., and G. Feld. Secretary: Doris O. B. Carruthers. Regd. office: 59, Brompton Road, S.W.3.

Liquidation

Thermoray, Ltd., electro-medical instrument manufacturers.—Winding up voluntarily. Liquidator, Mr. A. Freestone, Le Chene, Common Road, Claygate, Surrey, appointed 26th September. Particulars of claims to the liquidator by 10th November. This notice is purely formal; all known creditors have been or will be paid in full.

Bankruptcies

S. L. Blythe, G. N. Bryan and **D. Mosley**, formerly trading in co-partnership under the style of "Kirkstall Radio & Electrical Service," at Kirkstall Lodge, Edwinstowe, Notts, radio and electrical engineers.—Trustee, Mr. R. B. Smith, York House, 3, Alfred Street, Leeds, 1, appointed 15th October.

E. J. R. Tremlett, 941, Wimborne Road, Moordown, Bournemouth, radio and electrical dealer.—First meeting to-day (Friday) at the Official Receiver's office, 16, Westwood Road, Southampton. Public examination 24th November, at the Law Courts, Stafford Road, Bournemouth.

A. Parsons, 23, Clifton Crescent South, Rotherham, Yorks, lately carrying on business at 25, High Street, Rotherham, electrician.—Supplemental dividend of 13s 10d in the £, payable from 21st October at the Official Receiver's office, 55, Queen Street, Sheffield, 1.

W. D. Newell, 35, Duke Street, Padstow, Cornwall, radio and electrical engineer.—First dividend of 4s 11d in the £, payable from 20th October at 25, Market Place, Camelford, Cornwall.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 15th November.

B.I. CALLENDER'S (design). No. 707,320, Class 6. Wires, strands and braids, all of common metal or of common metal alloys and being non-insulated materials for electrical purposes except fuse or resistance material; common metals for use in plumbing and soldering to make electrical connections, metal masts for supporting overhead electric conductors, and parts of and fittings for such masts, being goods of common metal included in Class 6.—British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.

THE VICTORY SAFETY IRON. No. 706,985, Class 9. Electric flat irons.—Bvlock Electric, Ltd., 109, South Street, Ponders End, Middlesex.

EIDOPHOR. No. 709,829. EIDOPHOR (design). No. 709,900. Both Class 9. Apparatus included in Class 9 for use in physics, optical apparatus, electrical apparatus included in Class 9, radio and television apparatus, cinematograph apparatus and projecting apparatus; and parts and fittings included in Class 9 for the aforesaid goods.—Dr. Edgar Gretener A.G., Zurich, Switzerland. Address for service: c/o Abel & Imray, Quality House, Quality Court, Chancery Lane, London, W.C.2.

UNICORN. No. 709,953, Class 9. Loudspeakers.—Trix Electrical Co., Ltd., 1–5, Maple Place, Tottenham Court Road, London, W.1.

STOCKS and SHARES

QUIET conditions continue to prevail in the Stock Exchange, but prices have been well maintained in most sections outside the commodity markets, where lead and copper shares are flat. Where changed at all, gilt-edged stocks have improved by a fraction. The few alterations in industrial share quotations are mainly favourable. Ericssons, Ever Ready, Brush, Ward & Goldstone and Siemens have hardened, and Switchgear & Cowans improved a shade on the advance which followed the new issue announcement. London Electric Wire were marked up to 48s 3d on the declaration of an increase in the interim dividend from 4 to 5 per cent, although this is described by the company as being only a matter of accountancy. Activity developed in Parnall (Yate), which are 6d up at 4s 6d, and B.E.T. deferred is another firm spot on the increase from 7½ per cent to 10 per cent in the interim dividend.

Cable & Wireless Offer

Cable & Wireless (Holding) is faced with the problem of repaying £3·6 million loan stock by the end of next year, and proposes to deal with it by inviting holders to convert their stock into a new 5 per cent debenture, redeemable at 100 between 1972 and 1977. Holders of the 4 per cent loan stock which falls due for repayment in 1960, are offered conversion of up to half their holdings into the new stock. The full particulars will doubtless make an attractive appeal to stockholders more interested in a good yield over a lengthy period, than in short-term capital stability. The new stock will be well secured from the point of view of the company's assets and earnings, and a 5 per cent yield looks well in comparison with the return of about 4¼ per cent on roughly comparable gilt-edged stocks such as 4¼ per cent British Electricity stock 1974–79, quoted at 99½.

Joseph Lucas

The opening of the motor show serves as a reminder that Joseph Lucas (Industries), to give the company its new name, is due to declare next month the final dividend and preliminary results for the year ended last July. At their present price of 33s 9d, the company's £1 ordinary shares show a yield of no more than 4½ per cent on the basis of the 7½ per cent total paid for last year, a position which indicates market hopes of something better, either now or later on. They are based on the fact that last year's dividends on ordinary and preference capital of £7·1 million took only £266,000 out of a distributable surplus of over £2½ million and despite the capitalization of more than £4 million reserves in the 200 per cent share bonus of 1949. The reserves had already been rebuilt to a total much above the amount of issued capital.

Walsall Conduits

The price of the 4s ordinary shares of Walsall Conduits rose sharply last July on the occasion of the one-for-three share bonus announcement, and have since been well supported at 4⅝s. This is equivalent to 60s in the old form, a price well above that obtaining at the beginning of the year. Although the amount of ordinary capital now participating is one-third larger than before, the interim dividend for the current year has been maintained at 20 per cent, as forecast by the chairman at the time of the bonus. He did not commit the board to an estimate for the full year, but hopes are naturally entertained that the total will again be brought up to 70 per cent, the rate paid (including 15 per cent as bonus) in each year since the war. In that event, the shares will show a yield of 6¼ per cent at the present price.

Babcock & Wilcox

Last week's declaration of a 7½ per cent interim dividend, the same as before, by Babcock & Wilcox may be taken as an occasion for comment on the persistent rise which has been in progress in the price of the company's £1 ordinary shares. At 72s they are now a clear 10s above their quotation in the middle of the year, and show, on the basis of last year's distribution of 18 per cent, a return of the level 5 per cent, which marks them out as an industrial investment in the highest grade. Earnings of the group in 1951 represented just on 100 per cent gross on the ordinary capital of £5 million, so that substantial cover for the dividend is added to the other investment qualifications, which include a balance-sheet position suggesting capital bonus possibilities at some future time. Referring at this year's annual meeting to a bank overdraft of £1½ million, the chairman was by no means certain that this would need any funding operation.

Miscellaneous Matters

Murex £1 shares were little affected by news that the company has applied for permission to issue 200,000 new shares to present stockholders; no price has yet been mentioned. Advance warning of an issue was implied by the company's action a month ago in increasing the authorized capital, a step taken in view of the expansion of the business and of future capital requirements. In commodity markets, lead shares are depressed by the fall in the price of the metal which has occurred since the resumption of free dealings. Sympathetic weakness in Rhodesian coppers was aggravated by news of a labour strike. Rubber shares are friendless on reports that many estates can do little better than break even, with costs and the price of the commodity at their present levels.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 20th Oct. 1952	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	84	+½	3	11	5
Brit. Elec. 1974/77	3	3	82½	—	3	12	9
Brit. Elec. 1976/79	3½	3½	88½	—	3	19	1
Brit. Elec. 1974/79	—	4½	99½	—	4	5	5
Calcutta Elec. ..	6†	6†	20 6	—	5	17	1†
East African Power	7	7	21 6	—	5	11	3
Nigerian Elec. ..	10	10	21 3	—	—		
Palestine Elec."A"	5†	Nil	12 6	—	—		
Perak Hydro-Elec.	Nil	Nil	13 9	—	Nil		
Equipment and Manufacturing							
Aberdare Cables (5/-)	20	20	13 6	—	7	8	3
Aerialite (1/-) ..	83½	88½	8 3	—	10	11	2
Aron Elec. Ord. ..	15	15	33 9	—	8	17	9
Assoc. Elec. Ord...	20	20	72 6	—	5	10	6
Automatic Tel. & El.	15	15	56 3	—	5	6	8
Babcock & Wilcox	18	18	72 -	—	5	0	0
Baldwin, H. J. (2/-)	25	25	4 -	—3d	12	2	6
Bakelite (10/-) ..	—	—	17 6	—	—		
British Aluminium	10	12	13 9	—	5	9	7
B.I. Callender's ..	7½	9	32 6	—	5	10	9
British Thermostat (5/-)	30	30	27 -	—	5	11	1
British Vac. Cleaner (5/-)	25	25	13 -	—	9	12	1
Brook Motors (10/-)	20	20	28 9	—	6	19	2
Brush Ord. (5/-) ..	10	10	5 -	+3d	10	0	0
A. F. Bulgin (1/-)..	27½	30	2 6	—	12	0	0
Burco (5/-) ..	42½	38¾	21 3	—	9	2	3
Chloride El. Storage	15	15	58 9	—	5	2	0
Cole, E. K. (5/-) ..	25	25*	15 9	—	7	18	9
Cossor, A. C. (5/-)	Nil	10	8 6	—3d	5	17	8
Crabtree (10/-) ..	17½	17½	34 -	—	5	3	0
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	9 -	—	6	5	0
De La Rue (5/-) ..	50	35*	10/-	—6d	—		
Decca (1/-) ..	112½	112½	18 -	—6d	6	5	0
Dewhurst (2/-) ..	35	22½*	4 6	—	—		
Dictograph Tel.(2/-)	20	20	4 9	—	8	8	6
E.M.I. (10/-) ..	8	12	15 9	—	7	12	3
Electrical Components (5/-) ..	20	20	10 -	—	10	0	0
Elec. Construction	15	15	50 -	—	6	0	0
Enfield Cable Ord.	7½	7½	23 9	—	6	6	4
English Electric ..	15	15	55 6	—	5	8	1
Ericsson Tel. (5/-)	22†	22*†	40 -	+6d	2	12	6†
Ever Ready (5/-)	35	35	26 6	+6d	6	12	1
Falk Stadelmann	15	15	38 -	—	7	17	10
G.E.C. Ord. ..	17½	22½	49 6	—	5	11	1*
General Cables (5/-)	30	30	14 6	—	10	6	10
Greenwood & Batley	15	15	37 -	—	8	2	2
Hackbridge Cable (5/-)	20	20	11 3	—	8	17	10
Hackbridge Hewittic (5/-)	18	20	16/3	—	6	3	0
Hall Tel. Acc.(10/-)	10	10	10 6	—	9	10	6
Hentrae (2/-) ..	12½	12½	4 -	—	6	5	0
Henleys (5/-) ..	20	20	17 9	—	5	12	8
Holophane (5/-) ..	15	20*	11 3xd	—	8	17	10
Hoover (5/-) ..	37½	35*	24 -	—	7	5	9

Company	Dividend Previous	Dividend Last	Middle Price 20th Oct. 1952	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	20	25	24/-	—	5	4	3
Johnson & Phillips	15	15	53 3	—	5	12	9
Lancashire Dynamo	22½	12½*	42 6	—	5	17	8
Laurence, Scott (5/-)	12½	15	12 9	—	5	17	8
London Elec. Wire	10	12½	48 3	+9d	5	3	9
J. Lucas	17½	7½*	33 9	—	4	9	0
Marryat & S. (2/-)	22½	22½	5 -	—	9	0	0
Mather & Platt ..	12½	12½	42 6	—	5	17	8
Metal Industries ..	10	15	39 6	—3d	—		
Mid. Elec. Mfg. ..	15	15	53 9	—	5	11	6
Murex	12½	15	53/6	—	5	12	3
Newman Ind. (2/-)	6	10	2 3	—	8	17	10
Oldham & Son (1/-)	30	35	3 -	—	—		
Parnall (Yate) (5/-)	6	6	4 6	+6d	6	13	4
Parsons, C. A. ..	15	10*	53 9	—	—		
Plessey (5/-) ..	20	22½	19 9	—	5	14	0
Pye Deferred (5/-)	18	18	15 3	+3d	5	18	0
Revo (10/-) ..	27½	27½	40 -	—	6	17	6
Reyrolle	15	10*	47 6	—	—		
Scot. Cable (4/-) ..	30	32	11 3	—	—		
Siemens Ord. ..	10	10	33 6	+6d	5	19	6
Strand Elec. (5/-)..	17½	17½	8 9xd	—	10	0	0
Sturtevant (5/-) ..	16¼†	17½*†	25/-xd	—	—		
Switchgear & Cowans (5/-)	22½	22½	14 6	+3d	7	15	2
Taylor T. (5/-) ..	20	20	20 -	—	5	0	0
T.C.C. (10/-) ..	20	20*	37 6	—	—		
T.C. & M.	10	10	26/-	—	—		
Telephone Mfg. (5/-)	10	10	8 -	—	—		
Thorn Elec. (5/-) ..	10	12½	8 6	—	7	7	0
Tube Investments	25	25	55 9	—	—		
Vactric (5/-) ..	Nil	Nil	3 9	—	Nil		
Veritys (5/-) ..	Nil	7½	4 9	—	7	18	0
Walsall Conduits (4/-)	70	70	45 -	—	—		
Ward & Goldstone (5/-)	45	45*	32 6	+1/-	—		
Watford (2/-) ..	25	25	6 2	—	8	0	0
Westinghouse Brake	14	14	49 3	—1/-	5	13	9
West, Allen (5/-) ..	12½	15	10 3	—	7	6	4
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord. ..	4½	4½	86½	+1	5	4	0
Ord.	56/3	57/6	55	—	—		
Anglo-Portuguese	8	8	20 6	—	7	16	1
Brit. Elec. Traction: Def. Ord. ..	22½	25	150	+2s	5	11	2
Cable & Wireless: Ord.	6	8	12†	—1½	6	9	1
4% Loan ..	4	4	97	+2½	4	2	6
Calcutta Trams ..	6†	6†	22 6	—	5	6	8
Cape Elec. Trams	4	5	12 -	—	8	6	8
Marconi Marine ..	7½	10	30/6	—	6	11	2
Oriental Tel. Ord.	16	16	56 3	+6d	—		
Telephone Props...	8	8	32 6	—	4	18	6
Tele. Rentals (5/-)	10	10	8 9	—	5	14	3

* After capital bonus.
† Dividends are paid free of Income Tax.

NEXT WEEK'S EVENTS

Monday, 27th October

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio Group. "Why Quantum Theory Matters to Engineers," by D. A. Bell.

BOURNEMOUTH.—Grand Hotel, Firvale Road, 8.15 p.m. A.S.E.E. Bournemouth Branch. "Pyrotenax Cables," by G. E. D. Redman.

CARDIFF.—S. Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Utilization Group. Visit of Utilization Section Chairman, Dr. J. W. T. Walsh.

CHESTER.—Town Hall, 6.30 p.m. I.E.E. Mersey & North Wales Centre. "The Application of Transductors as Relays to Protective Gear," by R. K. Edgley and F. L. Hamilton.

ENFIELD.—George Hotel, 7.30 p.m. Purchasing Officers' Association, Enfield Group. "Report on National Conference and Minibition," by R. H. Ingleby.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. "Lighting the Streets," by H. E. G. Watts.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Discussion on "The Impact of Television on Sound Broadcasting," opened by G. Parr.

Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Economy in Choice of Switchgear," by L. J. Bamber.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

STAFFORD.—King Edward VI School, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "The Use of Electricity in a Modern Iron and Steel Works," by W. F. Cartwright

Tuesday, 28th October

ARBORFIELD.—R.E.M.E. Depot, 7 p.m. I.E.E. London Students' Section. District Meeting. "The Use of Working Scale Models in the Development of Broadcasting Aerials," by T. R. Boys.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "Domestic Electrical Installations: Some Safety Aspects," by H. W. Swann.

351, Sauchiehall Street, 6.30 p.m. Institution of Heating and Ventilating Engineers, Scottish Branch. "High Temperature Industrial Radiant Panels," by E. B. T. Tanner.

LONDON.—Mansion House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "The Design of Sliding Contact Assemblies in Instrument Applications," by D. O. Walter.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurements Group. "Telemetering for System Operation," by R. H. Dunn and C. H. Chambers.

WOLVERHAMPTON.—Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "A Survey of Television Development and its Problems," by H. J. Barton-Chapple.

YORK.—Royal Station Hotel, 7 p.m. I.E.E. North Midland Centre. "Economic Plant Sizes and Boiler-Set Groupings on the Grid," by B. Donkin and P. H. Margen.

Creamery Restaurant, 7.30 p.m. A.S.E.E. York Branch. "Some Aspects of the High Rupturing Capacity Fuse," by L. A. Fry.

Wednesday, 29th October

BIRMINGHAM.—Chamber of Commerce, 95, New Street, 6.45 p.m. Royal Statistical Society, Industrial Applications Section, Birmingham Group. "Statistical Quality Control in a Laboratory," by R. J. A. Martin.

DAGENHAM.—Illuminating Engineering Society. Visit to the Ford Motor Company's Works.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Domestic Electrical Installations: Some Safety Aspects," by H. W. Swann.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. Chairman's Address, by C. M. Cock.

Institution of Electrical Engineers, Victoria Embankment, S.W.1. Industrial Productivity Conference organized by the British Electrical Development Association. To be continued on 30th October. Conference luncheon 29th October, Savoy Hotel, 12.30 for 1 p.m.

I.E.E. London Students' Section. 8 p.m. Visit to Charrington's Brewery, E.1.

London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 5.15 p.m. Royal Statistical Society, Research Section. "Sequential Estimation," by F. J. Anscombe.

At the Institution of Civil Engineers, Great George Street, S.W.1, 6.30 p.m. Institute of Welding. "Modern Developments in the Industrial Application of Resistance Welding," by H. E. Dixon.

Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers. Informal meeting. Vice-chairman's Address, "Some Aspects of Local Line Utilization."

LUTON.—George Hotel, 8 p.m. A.S.E.E. Luton Branch. "Motor Starting and Apparatus applied thereto," by R. F. Mathieson.

RUGBY.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "A Logical Approach to the Problems of Electric Space-Warming," by D. H. Parry.

SCUNTHORPE.—Technical College, 7 p.m. I.E.E. Sheffield Sub-Centre. "The Electrical Control of Dangerous Machinery and Processes: Part III, Remote Supervisory Control," by W. Fordham Cooper.

Thursday, 30th October

BRISTOL.—At Carwardines, Ltd., Baldwin Street, 7.45 p.m. Purchasing Officers' Association, West of England Branch. Joint meeting with I.S.M.A. and U.C.T.A.

Electricity House, 7 p.m. I.E.E. Bristol Students' Section. "Symmetrical Components: Their Practical Use in Electricity Supply Network Calculations," by F. W. C. Hill.

EXETER.—Imperial Hotel. Exeter Electric Club. Lecture by the Earl of Verulam. "Power at your Elbow."

LONDON.—Savoy Hotel, W.C.2, 7 for 7.30 p.m. Faraday House Old Students' Association. Annual dinner.

SHEFFIELD.—Grand Hotel, 6.30 p.m. Royal Statistical Society, Industrial Applications Section, Sheffield Group. "The Statistically Based Production Control of Heterogeneous Output," by S. Beer.

Grand Hotel, 7.30 p.m. Incorporated Plant Engineers, South Yorkshire Branch. "The Woodhead New Tunnel."

Friday, 31st October

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Centre. "The Evaluation of Lighting," by R. G. Hopkinson.

CARDIFF.—Royal Hotel. I.E.S. Cardiff Centre. Annual supper dance.

LONDON.—Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. "Machine Tool Simplification, Especially as Applied to Horizontal Boring Machines," by C. A. Sparkes.

Townsend House, Greycoat Place, S.W.1, 7 p.m. Junior Institution of Engineers, "Some Problems in the Design of Motion Picture Sound Equipment," by W. C. C. Ball.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. Open discussion meeting.

NEWCASTLE.—At the Literary & Philosophical Society, 6.15 p.m. North East Coast Institution of Engineers & Shipbuilders. "From Stodola to Modern Turbine Engineering," by C. Seippel.

Saturday, 1st November

HUDDERSFIELD.—Yorkshire Electricity Board Offices, Market Street, 2.30 p.m. I.E.E. North Midland Students' Section. Sheffield exchange paper.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 3rd December from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1948

4696. Lubszynski, H. G., McGee, J. D., Turk, W. E., and Cassman, H.—Electron discharge pick-up tubes suitable for use in television. 26th January, 1949. (683603.)

10953. White, E. L. C.—Television apparatus employing non-linear circuits. 26th March, 1949. (683605.)

16447. Reyrolle & Co., Ltd., A., Young, A. F. B., and Ellis, N. S.—Electric current transforming devices. 8th June, 1949. (683522.)

26099. Duuren, H. C. A. Van.—Signal regenerators for telegraph and like systems. 15th March, 1949. (683607.)

30087. Standard Telephones & Cables, Ltd., and Klepp, G. F.—Electric discharge tubes and circuit arrangements therefor. 19th November, 1948. (683611.)

31359. Standard Telephones & Cables, Ltd., Terry, V. J., Hargreaves, T. F. S., and Prior, H. T.—Carrier telegraph systems. 2nd December, 1949. (683612.)

1949

2309/10/11. Marconi's Wireless Telegraph Co., Ltd.—Navigation aiding radio systems. 25th January, 1950. (683687/8/9.)

3044. Compagnie Générale de Télégraphie sans Fil.—Valves of the magnetron type. 3rd February, 1949. (683524.)

4155. Marconi's Wireless Telegraph Co., Ltd.—Aerial systems. 10th February, 1950. (683525.)

7275. Electric & Musical Industries, Ltd.—High-frequency impedances. 7th March, 1950. (683802.)

8508. British Thomson-Houston Co., Ltd.—Air blast high-voltage electric circuit breakers. 29th March, 1949. (683804.)

15722. Aron Electricity Meter, Ltd., and Reordan, E. J.—Construction of insulating bobbins for electric coils and the like. 13th June, 1950. (683618.)

24188. Western Electric Co., Inc.—Refractors for compressional waves. 23rd September, 1949. (683534.)

24189. Western Electric Co., Inc.—Refracting devices for electromagnetic waves. 23rd September, 1949. (683535.)

24946. Standard Telephones & Cables, Ltd.—Regulation of electric supply circuits. 22nd September, 1950. (683810.)

25416. British Communications Corporation, Ltd., and Heftman, T. S.—Circuits embodying electron-discharge valves. 3rd January, 1951. (683697.)

25860. Metropolitan-Vickers Electrical Co., Ltd.—System and means for the location of moving objects. 25th May, 1950. (683536.)

26462. General Electric Co., Ltd., and Friedlander, E. S.—Electric transformers. 13th October, 1950. (683621.)

30570. Thornton, A. A. (Ferro Enamel Corporation).—Electric smelter for producing porcelain enamel. 29th November, 1949. (683701.)

31061. Burrell, E. J., and Burrell, C.—Multiple-contact electric process timer. 4th December, 1950. (683540.)

31216. Standard Telephones & Cables, Ltd.—Dry contact rectifiers. 1st December, 1950. (683817.)

33264. Sunvic Controls, Ltd., and Ashe, T. S.—Electrical energy regulators. 15th December, 1950. (683819.)

1950

582. Ashley Accessories, Ltd., and Everitt, L. H. R.—Dolly-operated electric switches. 4th December, 1950. (683543.)

2638. General Electric Co., Ltd.—Pulse code signalling systems. 8th January, 1951. (683820.)

4114. Hackbridge & Hewittic Electric Co., Ltd., and Strike, H. S. P.—Mercury arc rectifier apparatus. 7th February, 1951. (683708.)

4866. Metropolitan-Vickers Electrical Co., Ltd.—Power-plant. 23rd January, 1951. (683823.)

5377. Pye, Ltd.—Television camera. 2nd March, 1951. (683549.)

5783. General Electric Co., Ltd.—Electric pulse code signalling systems. 21st February, 1951. (683824.)

6548. Marconi's Wireless Telegraph Co., Ltd.—Radio navigation aids for aircraft. 15th December, 1950. (683710).

7291. Plessey Co., Ltd., and Roe & Co., Ltd., A. V.—Terminal block for multiple electric cables. 5th February, 1951. (683827.)

10252. Denny, C. W.—Portable electric battery lamps. 23rd April, 1951. (683714.)

11142. Grundig Radio-Werke Ges.—Driving and centring system for moving-coil loudspeakers, microphones and relays of thermoplastic material. 5th May, 1950. (683832.)

11663. Evershed & Vignoles, Ltd.—Electrical indicating or repeating systems. 10th May, 1951. (683715.)

13662. Standard Telephones & Cables, Ltd.—Crystal triodes. 25th May, 1951. (683558.)

14134. McDonald Furnaces, Ltd.—Supports for resistance heating elements in electrically heated furnaces. 1st June, 1951. (683559.)

15024. Ferranti, Ltd.—Storage water heaters. 11th June, 1951. (683839.)

16635. Standard Telephones & Cables, Ltd.—Ferromagnetic materials. 29th June, 1951. (683722.)

18627. Electric & Musical Industries, Ltd.—Radio receivers. 29th June, 1951. (683841.)

18893. Standard Telephones & Cables, Ltd.—Code-signalling systems. 28th July, 1950. (683843.)

19065. British Thomson-Houston Co., Ltd.—Lighting control systems. 31st July, 1950. (683780.)

19316. Belcher (Radio Services), Ltd., and Howell, E. C.—Aerial arrays. 1st August, 1951. (683844.)

21884. General Electric Co., Ltd., and Scowcroft, J.—Automatic telephone systems. 14th August, 1951. (683847.)

22085. British Thomson-Houston Co., Ltd.—Welding. 7th September, 1950. (683848.)

24066. Elliott Bros. (London), Ltd.—Electric control systems. 30th August, 1951. (683571.)

24748. Svenska Ackumulator Aktiebolaget Jungner.—Electric cells. 10th October, 1950. (683650.)

24768. Staatsbedrijf der Posterijen, Telegrafie en Telefonie.—Automatic volume control device. 10th October, 1950. (683726.)

25415. Peters, J. A., Bird, R. C., and Puttick, H. G.—Controlling the prime mover in electrical generating installations. 18th October, 1950. (683573.)

25491. Philips Electrical Industries, Ltd.—Systems for duplex communication between stationary and mobile radio stations. 19th October, 1950. (683727.)

30344. British Thomson-Houston Co., Ltd.—Power-driven clothes wringers. 12th December, 1950. (683789.)

30743. Allmanna Svenska Elektriska Aktiebolag.—Electro-magnetic slip couplings. 18th December, 1950. (683581.)

30781. British Thomson-Houston Co., Ltd.—Insulating structures. 18th December, 1950. (683855.)

1951

276. Scarpa, G.—Electric transformer, more particularly for high-power and high-tension. 3rd January, 1951. (683657.)

822. Westinghouse Electric International Co.—Vapour electric-discharge devices. 11th January, 1951. (683793.)

920. Western Electric Co., Inc.—Telephone station identifier circuit. 12th January, 1951. (683794.)

3243. Metropolitan-Vickers Electrical Co., Ltd.—Alternating current electric measuring circuit arrangements. 7th January, 1952. (683586.)

3699. Platen, B. C. Von.—Electric-heating bottles. 15th February, 1951. (683587.)

6368. Standard Telephones & Cables, Ltd.—Variable inductance for short and ultra-short waves. 16th March, 1951. (683863.)

E.W.F. in Scotland

FOLLOWING custom, the Council of the Electrical Wholesalers Federation accepted the invitation of its Scottish Section to hold a Council meeting in Scotland during the week commencing 6th October, and subsequently to join the Scottish members in their relaxations. The venue on this occasion was North Berwick, and as in previous years, the Scotsmen invited members of the Councils of the Electric Lamp Manufacturers' Association and the Rubber & Thermoplastic Cable Manufacturers' Association, with their wives, to take part. Those who attended on behalf of the E.L.M.A. were Mr. W. Jones (director), Mr. and Mrs. C. J. W. Scott, Mr. and Mrs. H. A. Deacon, Mr. and Mrs. F. E. C. Miller, Mr. and Mrs. N. V. Everton, Mr. and Mrs. H. C. White, and Mr. and Mrs. C. A. Hughes. The R.M.C.A. was represented by Mr. and Mrs. J. S. A. Bunting, Mr. and Mrs. W. L. Smith, Mr. and Mrs. B. Keywood and Mr. and Mrs. W. E. Hind.

The visitors started assembling over the week-end, although the first official business was a Council meeting on the Wednesday morning, to which the members of the Scottish Section were invited. Thursday was devoted to golf competitions, and tours to neighbouring places of interest. On the Thursday night the Scots entertained their visitors to dinner, when eighty people sat down. Mr. A. Glenister, chairman of the Scottish Section, took the chair, and proposed the toast of the guests, Mr. N. V. Everton (chairman, E.L.M.A.) and Mr. J. S. A. Bunting (chairman, R.C.M.A.) responding. Mr. J. E. Lamb proposed the toast of the ladies, and Mrs. Everton replied. Mr. W. H. Swain, president of the E.W.F., proposed the health of Mr. Glenister, the chairman, and coupled with his toast the thanks of the members of the E.W.F. Council. At the conclusion of the dinner, all joined in the dancing. A picture taken during the meeting was published in our last week's issue.

Underground Gasification

Minister Inspects Site

THE Minister of Fuel and Power (Mr. Geoffrey Lloyd) last week visited the underground gasification site at Bayton, Worcestershire, where exploratory drillings were begun last year. It is about half the size of the older site at Newman Spinney, near Chesterfield.

At Bayton a gas engine has operated on the gas produced and has generated electricity, while at Newman Spinney a steam plant has been installed with the same object in view. The trials have therefore achieved their first purpose of confirming that the process is technically practical. They are now concerned with developing reliability and reducing cost so that in due course substantial areas of coal seam may be gasified continuously to produce electricity over a period of years at an economic cost. A difficulty to be overcome is that while gasifying the coal between two vertical boreholes there comes a time when the quality of the gas deteriorates and becomes useless; means are being sought to delay this deterioration as long as possible and then to transfer the reaction to a new section of the coal seam.

There are two main seams at Bayton, namely Bank Farm, about 5ft thick, and above it Broseley, nearly 3ft thick. Preliminary tests have been made on the Bank Farm seam between boreholes 150ft apart. This is the first time high pressure air has been passed through a seam as deep as 230ft. The system will be ignited in the near future.

Damage to Hydro Scheme

THE cost of damage by flooding to the North of Scotland Hydro-Electric Board's scheme at Quoich and Invergarry, Inverness-shire, which is the subject of tabled questions in the House of Commons, is unlikely to fall on the Board. On 24th September the sandbag coffer dam at the outlet of Loch Quoich was swept away following a period of very heavy rainfall, and the following day a section of the sheet steel pile coffer dam at Invergarry, 13 miles down stream, gave way.

The damage may amount to several thousands of pounds, but the contracts of the Board provide that such contingencies are the financial responsibility of the contractors. The contractors, in turn, are understood to be covered by insurance companies. Reconstruction work is well under way at Invergarry where concreting is expected to be resumed in less than a fortnight. A stronger dam is now being constructed, with a concrete weir and sluice gates, which will, in the event of further flooding, be opened, allowing the River Garry to pass through the workings.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Ashington (Northumberland). — Urban District Council. Electrical installation in 50 houses in Darnley Road, Ashington. Surveyor, Town Hall.

Australia.—BRISBANE.—12th December. City Electricity Department. Twelve 33 kV, 400 A outdoor type oil circuit breakers. (C.R.E. 34337/52. Ten/4907.)*

Bath. — 3rd November. City Council. Laundry equipment. (See this issue.)

Belfast.—21st November. Electricity Department. Workshop machinery and equipment for Harbour power station. (See this issue.)

30th October. City Council. Electrical installation in part of the chemistry department at the College of Technology. Forms from the education architect, Academy Street.

Boston.—24th November. R.D.C. Electrical pumping machinery at the Sutterton re-pumping station. S. M. Forman, clerk, 126, London Road.

Bury.—31st October. Town Council. Conversion of unlighted pedestrian crossing beacons into illuminated flashing beacons. Forms from the borough engineer, Town Hall.

Dagenham.—1st November. Corporation. Lighting of pedestrian crossings. (See this issue.)

Durham.—7th November. County Education Committee. Electrical installations in Barnard Castle and Walworth Castle schools. (See this issue.)

Egypt. — CAIRO. — 1st December. Egyptian State Railways Telegraphs and Telephones. Underground cables. (C.R.E. 34896/52. Ten/4936.)*

Ellesmere Port.—13th November. U.D.C. Lighting of pedestrian crossing beacons. (See this issue.)

Formosa.—TAIPEI.—30th October. Central Trust of China. Supply of power cables. (C.R.E. 31967/52. Ten/4917.)*

Glasgow.—Rewiring electrical installation of Trevon & Co., 254/9, Sauchiehall Street. City engineer, City Chambers, P.O. Box 31, Glasgow.

Goole. — 10th November. Town Council. Electrical work for 110 houses in two contracts. Forms from the borough surveyor.

Ilkley. — 10th December. U.D.C. Street lighting equipment. (See this issue.)

London. — STEPNEY. — 28th November. Borough Council. Electrical installations in blocks of flats and houses. (See this issue.)

Longbenton.—3rd November. U.D.C. Electrical installations at Wideopen estate. (See this issue.)

Newbiggin (Northumberland). — 25th November. Urban District Council. Electrical installation in 12 houses on the Spital estate. H. S. Robson, surveyor.

South Africa.—CAPE TOWN.—4th November. Cape of Good Hope Provincial Administration. Operating theatre lighting, Somerset East Cottage Hospital. (C.R.E. 34302/52. Ten/4912.)*

Stockport. — 7th November. Corporation. Illumination of pedestrian beacons. (See this issue.)

Stretford. — 17th November. Corporation. Electrical installations in 146 flats and maisonnettes. (See this issue.)

Uruguay. — MONTEVIDEO. — 4th November. Administracion Municipale de Transportes Colectivos. Supply of vulcanized cable. (C.R.E. 34791/52. Ten/4925.)*

5th November. Usinas Electricas y Telefonos del Estado. Two electrically driven pumping sets. (C.R.E. 34753/52. Ten/4923.)* 7th November. Carrier current telephone equipment and amplifiers. (C.R.E. 34170/52. Ten/4924.)* 20th November. Equipment for inspecting h.v. insulators. (C.R.E. 34574/52. Ten/4920.)*

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnsley.—Extensions to mining and technical college; Lyons & Israel, architects, 26, Seymour Street, London, W.1.

Croydon.—Factory, King Henry's Drive; British Metal Fabrications, Waterloo Place, London, S.W.1.

Community centre (£25,000), Addington estate; borough engineer.

Farnworth.—Factory for De Havilland Propellors, Ltd., Lostock, Bolton; J. M. Monro & Son, architects, 32, Clarendon Road, Watford.

Fleetwood.—Factory extensions, Wyre Dock; H. Pearce & Son.

Gateshead. — Electrical work at proposed Dryden Road Grammar School; R. W. Gregory & Partners, consultants, Pilgrim House, Newcastle-on-Tyne.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Glasgow.—New building at Paisley Road, for Cassidy & Co., Ltd.; Stewart & Patterson, 110, Blythswood Street, Glasgow.

Extensions to Remington Rand factory for Scottish Industrial Estates, Ltd.; Wylie, Shanks & Wylie, 120, Blythswood Street, Glasgow.

Extensions at Vicarfield Street for Darlington Insulation Co., Ltd.; John Keppie & Henderson, 196, West Regent Street, Glasgow.

Additions to shipbuilding yard for Barclay Curle & Co., Ltd.; McNair, Elder & Ramsay, 529, Sauchiehall Street, Glasgow.

Extensions at Cowlairs for North British Locomotive Co., Ltd., Flemington Street, Glasgow; company's own architects.

Glendale.—Houses (20), Millfield, for R.D.C.; A. R. Field, surveyor, Council Offices, Wooler.

Golders Green.—Research laboratory and office building, Manor House Hospital; Management Committee of Industrial Orthopædic Society, North End Road, N.W.11.

Hendon.—Branch library, Burnt Oak; borough engineer.

Jarrow.—Roman Catholic school; Benjamin Peel, Ltd., East Mill Works, North Shields.

Kirkcaldy.—Secondary school (£250,000) for Fife E.C.; R. S. Lawrie, County Chambers, St. Catherine Street, Cupar.

London.—LAMBETH.—Flats (84), Lilford Road; Church Army Housing, Ltd., 55, Bryanston Street, W.1.

PADDINGTON. — Works extensions, Edgware Road; Schilling & Clarke, Ltd., 2a, New Church Road, S.E.5.

Londonderry.—Mill for Dunlop Cotton Mills, Ltd.; Stewart & Partners, Ltd., builders, Ormeau Road, Belfast.

Loughborough.—Houses (30) on first part of Ashby Road estate; W. Moss & Sons, Ltd., Loughborough. Houses (68); W. Davis & Co. (Leicester), Ltd., Forest Road, Loughborough.

Mansfield.—X-ray department at Kings Mill Hospital; E. G. Phillips & Son & Norfolk, electrical consultants, 26, Annesley Grove, Nottingham.

Houses (72), Clipstone, for Coal Industry Housing Association; W. Saunders & Partners, architects, 24, Castle Gate, Newark.

Maryport.—Houses (142) at The Arches for North-Eastern Housing Association; J. Laing & Sons, builders, Dalston Road, Carlisle.

Matlock.—Houses (152) on third section of Hurst Farm site; U.D.C. surveyor.

Newcastle-on-Tyne.—Maternity and child welfare centre for the City Council on Blakelaw estate (£14,000); Anglo-Scottish Construction Co., Ltd., builders, South Gosforth.

Occupational centre, Jubilee Road (£10,000); R. Bowey & Sons, builders, Back Raby Street.

Extensions to factory, Scotswood Road for Jebling & Purser, Ltd.; J. G. Temperley, 66, Nuns' Moor Road.

Newcastle (Staffs).—Development of site at Crackley Bank, Chesterton, for about 800 houses; borough surveyor, Lancaster Buildings, High Street.

Newton Aycliffe (Co. Durham).—Church, Central Avenue; Cordingley & McIntyre, architects, The College, Durham.

Northampton.—Residential block at Kings Heath and aged persons' homes at Kingsthorpe Grove estate; W. J. Richardson & Son, 30, Wycliffe Road.

Houses (146), Cogenhoe, Collingtree, Hardingstone, etc.; R.D.C. surveyor.

Otley.—Two three-storey blocks of flats in Fairfax Street; H. Halstead, clerk, North Parade.

Oxford. — College of further education (£219,845); E. G. Chandler, city architect, Town Hall.

Houses (52) at Cowley; city architect.

Portsmouth. — Reconstruction of war damaged workshops, The Camber (Vosper, Ltd.); J. Parkin, city engineer, 1, Clarence Parade, Southsea.

Home for old people at Wymering; J. Parkin, city engineer, 1, Clarence Parade, Southsea.

Twin operating theatres at St. Mary's Hospital; Barnes & Elliott, Ltd., builders, 15, Castle Road, Southsea.

Reconstruction works at Haslar Naval Hospital; Keith Andrew & Co., Ltd., builders, 7, Warwick Street, Worthing.

Rainford.—Extensions to works for Carborundum Co., Ltd.

Ripon.—Houses (over 250) on site in Lead Lane; town clerk, Town Hall.

Ruislip.—Shops (14) and flats (28), West End Road; U.D.C. surveyor, Oaklands Gate, Northwood, Middlesex.

Rutherglen.—Block of flats (16 houses), Princes Street; burgh surveyor, Town Hall Buildings.

Salisbury.—Divisional police headquarters; H. Rackham, city surveyor, Council House, Bourne Hill.

Sheffield.—Workshops and stores; C. R. Denton Steel & Tool Co., Ltd.; Solly Street.

Smethwick.—Three blocks of maisonnettes; E. L. Twycross, town clerk, Council House.

South Shields.—Conversion of church at Laygate into factory for Eskimo Slippers, Ltd.; G. R. Smith & Partners, architects, Charlotte Terrace.

Spennymoor.—Houses (54), Back Durham Road estate, for U.D.C.; J. Parsons, builder, Houghton-le-Spring.

Staveley.—Houses (40), Brimington; U.D.C. surveyor, Council Offices, Lowgates.

Sunderland.—Shops and flats, Thorndale Road; Tasker & Child, architects, 25, New Bridge Street, Newcastle-on-Tyne.

School, Radlett Road; borough architect, Stockton Road.

Taunton.—Houses (80), on four sites; clerk to R.D.C., Mary Street House.

West Bromwich.—Factory, Bromford Lane; Invincible Spring Co., Ltd., 37, Winkle Street.

West Ham.—Flats (93) and houses (24), Butchers Road area; borough architect.

West Riding.—Residential special school, Whinburn (£14,785); county architect, County Hall, Wakefield.

Whitby.—Houses (32), Mount estate, for U.D.C.; C. D. Taylor, architect, 41, Baxtergate.